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ARMOUR INSTITUTE
OF TECHNOLOGY

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President's Report

January, 1933, to September, 1934

Chicago, Illinois

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To the Alumni of Armour Institute of Technology.

Since the present administration of Armour assumed office in January, 1933, several reports have been made to the Board of Trustees and to the Executive Committee dealing with specific subjects which have been before the board for consideration. The following report to the Board of Trustees, which is also being sent to a complete list of alumni, is the first general report which the present administration has submitted. It covers the period from January, 1933, to September, 1934, and carries the Institute into the beginning of the current school year.

During the period immediately preceding my administration the generous aid of the alumni was a large factor in enabling the Institute to meet its problems in the difficult transition period that every private educational institution goes through when it ceases to depend exclusively upon the financial aid of one person or a small group of persons and reaches out for general community support.

Because of their proven loyalty to their Alma Mater, the alumni will of course be especially interested in knowing of the progress which has been made during the past year and a half and of the plans for the future with which that progress is interwoven. While, naturally, the official control of the Institute resides in its governing body, the Board of Trustees, as is true of all privately supported colleges, the alumni can play a large part in helping to insure success in the future as they have in the past. The following report is sent to the alumni with an expression of full appreciation of what they have done in the past and recognition of the importance which their continued interest and cooperation will have in the development of the Institute in the future.

It is hoped that the administration will have the benefit of questions which may occur to members of the alumni body in reference to current developments, as well as the opportunity of discussing personally with alumni who may be able to visit the Institute the problems which the members of the administration and the Board of Trustees are putting forth their most earnest efforts to solve.

WILLARD E. HOTCHKISS.

ARMOUR INSTITUTE OF TECHNOLOGY

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Term expires 1935.

Alfred S. Alschuler (alumnus)
Architect

Lester Armour
Capitalist

Vincent Bendix
President, Bendix Aviation Corporation

Homer H. Cooper
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Term expires 1936.

James D. Cunningham
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President, Illinois Central Railroad

Alfred L. Eustice (alumnus)
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Charles W. Hills, Jr. (alumnus)
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Vice President, Teletype Corporation

James O. McKinsey
President, James O. McKinsey and Company

John J. Mitchell
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Sterling Morton
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John J. Schommer (alumnus)
Professor of Chemistry

Term expires 1937.

George S. Allison
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Thomas S. Hammond
President, The Whiting Corporation

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Vice President, America Fore Fire Insurance Companies

Frank Knox
President, Chicago Daily News

William S. Monroe
President, Sargent & Lundy, Inc.

C. Paul Parker
Attorney

Stuyvesant Peabody
Peabody Coal Company

Charles R. Tuttle
Manager, Insurance Company of North America

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JAMES D. CUNNINGHAM ..... *Chairman of the Board of Trustees*
WILLARD E. HOTCHKISS ..... *President*
GEORGE S. ALLISON ..... *Treasurer and Assistant Secretary*
HOMER H. COOPER ..... *Secretary and General Counsel*

ARMOUR INSTITUTE OF TECHNOLOGY

PRESIDENT'S REPORT

January, 1933, to September, 1934

The constitution and by-laws adopted on June 1, 1934, provide that the President shall make an Annual Report to the Board of Trustees.

The present administration of the Institute took office in January, 1933. The legal, educational, administrative, and financial developments since that time constitute an interwoven sequence. This report, therefore, will cover the whole period from January, 1933, to the end of the academic and fiscal year just closed.

The legal status of the Institute and its properties has been greatly clarified during this time. Able and untiring efforts of the late Lester L. Falk so far untangled a maze of legal relationships between Armour Mission and Armour Institute of Technology that on October 25, 1933, the two Boards of Trustees were in a position to vote a merger of the corporations under the name of Armour Institute of Technology. On April 6, 1934, after some unavoidable delay, the merger was finally consummated.

When it appeared early in 1934 that the operating deficit in last year's budget would not be met by contributions it became imperative to release trust funds for this purpose. Conference was had with Mr. John E. MacLeish and Mr. Homer H. Cooper of Scott, MacLeish and Falk, of which firm Mr. Falk had been a partner, and the services of Mr. Cooper as general counsel were generously made available without cost to the Institute. As such, he at once undertook a comprehensive legal analysis of all the properties which the present Armour Institute of Technology had acquired through the merger with Armour Mission and otherwise. His findings were embodied in an extensive brief upon the basis of which Judge Hugo Friend of the Circuit Court of Cook County entered a favorable decree on August 9, 1934. This decree accomplished the following results:

1. It confirmed the acts of the Boards of Trustees of Armour Mission and Armour Institute of Technology, and the consolidation of those two corporations.
2. It authorized the new corporation to negotiate for disposition of and give clear title to certain real estate under the direction of the court.
3. It permitted the sale or hypothecation of securities in restricted endowment funds up to $100,000 for the purpose of meeting the uncovered deficit in the 1933-34 budget under the Institute's undertaking to restore the fund when able.

Contributions

These proceedings, in which the heirs of the late Philip D. Armour cooperated generously, enabled the Institute to meet a current emergency and to carry on while bringing operating income and expense more nearly into balance. The vast amount of legal detail involved in preparing the brief and carrying the suit through the court and the extraordinary wisdom with which Mr. Cooper handled the whole proceeding places his contribution, together with that of the late Mr. Falk, in a unique position and makes it in both dollars and moral value easily the outstanding contribution of the academic year just closed.

Another contribution of exceptional value to the Institute during the past fiscal year was the gift of $2500 from a friend of long standing to cover the cost of the Survey by James O. McKinsey and Company authorized soon after the present administration assumed office. Due to the fact that Mr. McKimsey contributed his own services to the value of several thousand dollars there was a residue of some $800 from this gift available for general expenses. There were also several contributions of $1000 and a considerable number of $500 but as indicated above, the total fell far short of meeting the need.

Since this report covers the period from January, 1933, payments of some $45,000 made between January and June, 1933, in fulfillment of previous pledges, should also be recorded. These payments were applied to the operating deficit of the year 1932-33. Further discussion of finances will follow reference to certain educational and administrative changes.

Survey Findings

In January, 1933, when the new administration took up its duties the Development Committee, created and given large powers by resolution of the Board of Trustees on September 4, 1931, had just completed an extensive survey of Engineering Education. This study out of which had evolved the so-called Armour Development Plan had not concerned itself primarily with internal conditions at Armour. The McKinsey Study, of which mention has just been made, constituted among other things, a reexamination of the Armour Plan directed especially toward the solution of pressing problems with which the Institute was immediately confronted. The Study was carried on in close cooperation with the administration and the staff.

It was obvious that any approach to practical measures would have to take account of the historical background of the Institute and of the nature and quality of the service which it had rendered in the past. Out of this background there has come an accumulated good-will reflected in a flow of qualified applicants for admission from year to year which has meant

an actual attendance of upwards of 800 students and an unquestioned potential attendance considerably greater. The Survey naturally explored ways and means of consolidating and enhancing this good-will.

Without arrogating to itself the wisdom required to define, much less to standardize, the art of good teaching or even good administration, the Survey considered man by man the personnel of the teaching and administrative staffs, primarily from the standpoint of the service which each person was in a position to render the Institute, both individually and as a member of a working team. Similar consideration was given to questions of curriculum.

Although there were several features of the so-called Development Plan which were based upon an abstract approach considerably different from the path of Armour's past development, the present administration proceeded from the premise that for some time to come the Institute will continue in all essentials to be the same type of school it has been heretofore. This premise assumes a four-year undergraduate College of Engineering and Architecture in which students are given opportunity to qualify as beginning practitioners in their professions, and at the same time are able to secure such fundamental education as will promote their growth and aid them in discharging whatever responsibilities their native talents, training and opportunities may bring.

From the standpoint of the type of school Armour is and has been, and of necessary financial and time limitations, it appears that Armour in common with many other engineering schools has had a tendency to overload some of its curricula with useful but somewhat specialized subjects which are expensive to maintain. Besides being expensive, too many such subjects limit unduly the time available for basic subjects, which in all competent discussion of engineering education are recognized as indispensable. For the most part, specialization can be more profitably carried on either as graduate work or in industrial and engineering research laboratories.

Another weakness which the Survey revealed was also one widely prevalent in American education. It arose from the fact that the organization and teaching of certain important subjects had not kept pace with the times, nor with standards recognized as essential for an outstanding engineering school. Without implication of criticising individuals, this appeared to be notably true in English, in the Social Sciences and in Shop Courses. Considering the question of teaching as a whole it is believed that our discoveries also ran true to form for colleges generally. Some teaching of exceptionally high order was found, a preponderance of good teaching, and some very poor teaching. Substantially the same thing can be said in respect to internal administration.

In addition to the problems directly connected with teaching, administrative personnel and curriculum, the new administration found it necessary to consider almost immediately a closely related question arising out of the research and testing carried on by certain members of the faculty with the use of Institute equipment. It is the policy of the Institute to encourage its teaching staff to undertake research for industry and for the advance of engineering science, and there is no occasion to define research in a narrow or highly restricted sense. It is, however, highly essential that any pecuniary features of work done for industry be not pemitted to dominate the teacher's interests nor to conflict directly or indirectly with his teaching obligations. It is also of course axiomatic from a business standpoint that the school in all such cases receive adequate consideration for the wear and tear on its equipment. If work that is not strictly research is done, prices charged for it should, in fairness, be higher than commercial prices.

While Armour has much important research to its credit, its immediate contribution must lie first in the soundness of its curriculum, the quality of its teaching, and in the effectiveness of its administration. Its present task is to maintain excellence in these lines without easy access to great resources. Armour's problem now, its problem during all the period covered by this report, and for some time prior thereto, has been one of crisis, and crisis forces retrenchment. But here again our situation differs from that of most American colleges, if at all, only in degree and not in kind, and retrenchment frequently becomes a stimulus to improvement.

Curriculum and Personnel Adjustments

From this background it is possible to take stock of the various adjustments in curriculum and personnel that have taken place since January, 1933. The first major adjustment was assumption of jurisdiction by the Institute over all research and testing activity in which Institute equipment is employed. This action of course had the effect of abrogating contracts and undertakings based on any different concept. The change affected both the relationships between the Institute and faculty members who do work of this kind and the mutual relationships between such faculty members themselves. There are a number of details in connection with previous arrangements which it is not necessary to rehearse, but the principal effect of the change was to place a new emphasis upon the obligations to the Institute which faculty members assume in carrying on engineering work for industry with Institute equipment.

In order to make a consistent policy effective, Professor Joseph B.

Finnegan was appointed Director of Research and Testing, and given specific instructions including the following items:

1. All arrangements concerning research, testing and consulting activity by members of the faculty, in which the use of Institute equipment is a factor, are to be made a matter of record with the Director of Research and Testing.
2. The Director of Research and Testing is responsible for insuring payment to the Institute of an amount adequate to cover the wear and tear on Institute equipment in connection with such activities.
3. The Director of Research and Testing, the Dean, and the Directors and Chairmen of departments are jointly responsible for scheduling research and testing activities by members of the faculty so as to avoid conflict with teaching and other obligations to the Institute.
4. The Director is advised that it is the policy of the Institute, in harmony with the above provisions, to encourage members of the faculty to carry on research in cooperation with industry.
5. The Director is instructed to cooperate with members of the faculty and with industry in enlarging the scope of the industrial research program, always in harmony with the policies set forth in paragraphs one, two and three, above.

Experience of more than a year under the new orientation has amply justified the present approach to this subject both from an educational and a financial point of view. With the revival of industry it is believed that a program of engineering research in cooperation with industry will become an increasingly important part of Institute activity.

The second major adjustment of the new administration was a temporary suspension of Shop Courses. While this action was taken under the pressure of financial necessity and reduced immediate expenses nearly $20,000, its justification rests primarily upon educational grounds.

Looking toward early re-establishment of Shop Courses, a comprehensive investigation to ascertain the most advantageous set-up of such courses was at once undertaken by a faculty committee with Professor Joseph B. Finnegan as chairman and Professor Philip C. Huntly as vice-chairman. The report of this committee is a document of which the Institute has reason to be proud; its publication at an early date is contemplated. Shop courses in conformity with the recommendations of this report will be started as soon as the exigencies of the budget permit; provision for them is the next item in our educational program. It is to be hoped that the new courses can be instituted early enough so that no student will have graduated from Armour without having the benefit of shop work.

It will be recalled that English was also mentioned as a subject in

which the McKinsey Report revealed that instruction was not up-to-date. Much of the English offered was estimable but it was not well articulated nor was the required work adequate in amount. Although one member of the English staff was retired last year and one this year, a third member has had the scope for his talents enlarged and two highly competent instructors have been added to the staff with a net saving of $2600. The organization and content of the work has been improved and made more pertinent to student need and its amount nearly doubled. Even the present amount is close to the minimum recognized by the Society for the Promotion of Engineering Education.

In Social Sciences the problem was more complex. Difficulty arose in part from a tendency of engineering students to regard non-engineering work lightly, in part from heavy schedules and in part from the rather casual way in which Social Science courses had previously been embodied in the curriculum. Prolonged deliberation led to the present organization of work in this field. Instruction now aims to emphasize the relationship of subject-matter to the actual work of an engineer. To this end, the courses start with business and engineering problems and proceed in the senior year to a study of business policy and public policy as they affect the engineer. In the course of this study, the student is introduced to such subjects as accounting and cost finding, principles of industrial management, and elements of economics and finance. After a careful survey of results in numerous engineering schools the traditional course in general economics has been omitted.

While work in the Social Sciences as now offered is of such a nature that no thoughtful engineer or engineering student can fail to recognize its necessary place in engineering education, it has not been the purpose to set up the Social Science courses on any narrow bread-and-butter basis any more than the fundamental science and engineering courses are on that basis. Elective courses in History and Political Science have been retained, and other elective courses will be offered to as great an extent as budget and schedule limitations permit. The total amount of required work in the Social Sciences is fifteen semester hours, or roughly double the number prior to the academic year 1933-34.

In the case of Social Sciences it has not been possible as it was in Shop Courses and English to realize any immediate or ultimate saving. On the contrary, there was an increase of some $8500 in the cost of instruction in this field, which amount has been materially reduced by changes this year.

The faculty as a whole has undergone considerable change during the past two years.

At the beginning of the present school year it lost one of its highly

esteemed members, Professor Van Bauman Teach of the Departmnt of Mathematics, who was taken by death on September 8, 1934.

Dr. George L. Scherger, whose cosmopolitan versatility has made him a prominent figure in Chicago life, has been granted a leave of absence from his service as Chaplain and Professor of History and Political Science, in order that he may devote his full time during the current year to the pastorate of St. Paul's Church with which he has been long associated.

Professor Charles W. Leigh, whose fine culture, comradeship and distinction as teacher and scholar have made him beloved of students, alumni and colleagues alike, has had to be retired for disability.

Two members of the faculty have gone to better paying positions, six teachers were released by suspension of Shop Courses, and readjustments following the McKinsey Study displaced fifteen others. Five men previously on full time are now on part time. The reduction in pay roll from the above changes is $86,615. Eight full-time and five part-time men have been added to the staff, at a cost of $20,700. One full-time man added last year has gone to a more highly paid position and has not been replaced.

It is highly regrettable when teachers of long standing on the staff of an institution are displaced but in this case there was no other way in which a critical situation could be met. For reasons set forth in discussing curricula and standards of instruction, and because in the course of time there had come to be an undue proportion of men in the higher ranks as compared with the lower, changes have not impaired educational efficiency and in many regards have definitely improved the organization of instruction as well as its quality.

In addition to changes in staff there has been considerable modification of internal organization. The title Head of Department has been abolished and the men in charge of Engineering Options have been made Directors of such Options. In Architecture the title is Director of the Department of Architecture. The so-called service departments are now presided over by Chairmen. The titles now used are believed to be more closely descriptive of the duties performed and it is hoped that they will not carry the implication of resting on seniority with which the title Head of Department appeared to be burdened.

General, as distinguished from departmental administration has been simplified and made less expensive. The titles Dean of Engineering, Dean of Evening Classes, and Dean of Freshmen have, for the time being, been abolished. Professor Henry T. Heald has been made sole Dean with full responsibility under the President for the educational program and internal activities of the Institute. The work of the Recorder has been enlarged considerably and his title changed to Registrar which carries full faculty status.

The President and the Dean will be aided by a Council made up of

mature men from the faculty and administration. It is expected that the Council will assist the administrative officers, not only in educational problems, but also, as occasion arises, in the financial affairs of the Institute.

The membership of the Council is as follows:

Willard E. Hotchkiss, President
Henry T. Heald, Dean
George S. Allison, Treasurer

Carman G. Blough
Arthur H. Carpenter
William W. Colvert
Henry P. Dutton
Herbert Ensz
Joseph B. Finnegan
Ernest H. Freeman
Benjamin B. Freud
Walter Hendricks
Philip C. Huntly
William E. Kelly
William C. Krathwohl
Albert H. Krehbiel
Edwin S. Libby
William F. McCaughey
Harry McCormack
John F. McNamara
John F. Mangold
David P. Moreton
Henry L. Nachman
Charles A. Nash
Charles E. Paul
James C. Peebles
John C. Penn
Robert V. Perry
Earl H. Reed
Donald E. Richardson
Otto L. Robinson
Daniel Roesch
John J. Schommer
John E. Snow
Roe L. Stevens
Charles R. Swineford
James S. Thompson
Charles A. Tibbals
Melville B. Wells
Stanton E. Winston

Special committees of the faculty have been appointed for the year 1934-35 as follows:

Placement Committee

James C. Peebles, Chairman

Henry P. Dutton
Joseph B. Finnegan
Ernest H. Freeman
Philip C. Huntly
Harry McCormack
Daniel Roesch
John J. Schommer
Walter L. Suter
Harold A. Vagtborg
William N. Setterberg, Secretary

Evening Class Instruction Committee

Henry T. Heald, Chairman Ex-officio

William E. Kelly
Edwin S. Libby
David P. Moreton
Robert V. Perry
Roe L. Stevens
James S. Thompson
Charles A. Tibbals

Curriculum Committee

John C. Penn, Chairman

Carman G. Blough
Joseph B. Finnegan
Philip C. Huntly
Ernest H. Freeman
Harry McCormack
Robert V. Perry
Earl H. Reed
Melville B. Wells

Graduate Courses Committee

Benjamin B. Freud, Chairman

Herbert Ensz
Charles E. Paul
Earl H. Reed
Donald E. Richardson
James S. Thompson
Stanton E. Winston

Publicity Committee

Charles E. Paul, Chairman

John J. Schommer — Arthur W. Sear

William N. Setterberg

Library Committee

John F. Mangold, Chairman

Arthur H. Carpenter — Henry L. Nachman

Watson M. Davis — Charles A. Nash

Walter Hendricks — John C. Penn

William B. Lockling — Ellen Steele, Secretary

Freshman Scholarship Committee

Charles A. Tibbals, Chairman

Samuel F. Bibb — Walter H. Seegrist

William E. Kelly — Stanton E. Winston

Fraternity Affairs Committee

David P. Moreton, Chairman

Carman G. Blough — Sholto M. Spears

John F. Mangold — Charles R. Swineford

Student Loan Committee

Benjamin B. Freud, Chairman

George S. Allison — David P. Moreton

William E. Kelly, Secretary

Student Publications Advisory Committee

Walter Hendricks, Chairman

William W. Colvert — Charles E. Paul

Joseph B. Finnegan — James C. Peebles

John F. Mangold

The present administrative personnel of options, departments, and research is as follows:

Architecture ..... Earl H. Reed, Director
Chemical Engineering ..... Harry McCormack, Director
Civil Engineering ..... John C. Penn, Director
Electrical Engineering ..... Ernest H. Freeman, Director
Fire Protection Engineering ... Joseph B. Finnegan, Director
Mechanical Engineering ..... Philip C. Huntly, Director
Course in Science ..... Charles E. Paul, Director
English ..... Walter Hendricks, Chairman
Mathematics and Mechanics ... Charles E. Paul, Chairman
Physics ..... James S. Thompson, Chairman
Social Sciences ..... Carman G. Blough, Chairman
Physical Education ..... John J. Schommer, Director
Research and Testing ..... Joseph B. Finnegan, Director

Immediate requirements of the budget necessitated on July 1, 1934, the release of Mr. Howard K. Lanigor and Mr. Robert M. Cunningham, Jr.,

whom the Development Committee employed at the end of the year 1932 to handle placement and certain other matters. Mr. William N. Setterberg, a graduate of the Armour Class of 1929, has been appointed as Personnel Officer; the replacing of two men by one with some readjustments nets a substantial saving.

The work accomplished by Mr. Lanigor and Mr. Cunningham in the fields in which they were occupied merits especial commendation. The continuing aid which Mr. Cunningham gave the incoming President was invaluable; and the placement work of Mr. Lanigor, in which Mr. Cunningham assisted, due to its emergency character in view of the large number of unemployed alumni, was especially noteworthy.

Personnel work at the Institute will be continued and strengthened. It is expected that the Dean, the Registrar, and the Special Placement Committee of the faculty will so far supplement the work of the Personnel Officer that efficiency will be maintained and foundations will be laid for the early establishment of all phases of personnel activity upon the highest possible basis of service to recent graduates and to alumni of earlier years.

It is highly important that every one connected with the Institute, trustees, faculty and alumni, give earnest attention to providing the Personnel Officer and the Special Placement Committee with complete information in respect to alumni. Information should not be confined to men who are seeking new employment; it should especially include outstanding alumni in important positions of responsibility. During the past six months a member of the Board of Trustees has had several openings carrying salaries from ten to fifteen thousand dollars a year which might have been filled by Armour alumni if men meeting the qualifications had been located in time.

Although, as frequently stated, adjustment in curriculum, teaching and administration during the past year and a half have been made under extreme financial pressure, it is firmly believed that the soundness of the educational program, the effectiveness of teaching and administration and internal morale at the Institute have seldom been on as high a level as they are at this moment.

Finance and Deficit

In times like the present there is naturally a measure of anxiety concerning finance, which the faculty shares with the trustees and the administration. However, an operating deficit of $50,000 for the current year compared with the deficit of past years is distinctly reassuring.

Reference has already been made to gifts of $45,000 in fulfillment of previous pledges during the second semester of 1932-33 when the present administration began. This amount constituted in the main final payment upon contributions to a maintenance fund which had been raised to carry the Institute through a five-year period from July 1, 1926, to June 30, 1931.

Alumni, faculty, and students contributed a substantial amount to finance the work of the development committee, to which reference was made early in this report. Together, the maintenance fund and the development fund totaled nearly a million dollars contributed roughly in the ratio of two-thirds from large individual contributors and one-third from alumni, faculty and students.

Due to extraordinarily careful management, the maintenance fund actually covered annual deficits for a period of seven years ending July 30, 1933, instead of the five years originally contemplated. The annual operating deficits from July 1, 1926, when the maintenance fund became available to the present time have been as follows:

1926-27	$148,600
1927-28	146,700
1928-29	136,200
1929-30	143,300
1930-31	147,700
1931-32	165,800
1932-33	144,700
1933-34	129,000**
1934-35	50,000

The problem confronting the Institute is immediately and definitely to underwrite this year's deficit; and following that, to adopt and carry through a workable plan for the future.

Future Site and Plant

The most pressing item in any program looking toward the future is provision for a suitable site and plant. In a report to the Board of Trustees during the summer of 1933 some of the serious consequences that have come from the deterioration of the neighborhood in which Armour is located were set forth in detail. Since that time, the following possibilities for meeting the problem of an operating plant have been or are being explored.

1. Temporary move of a major portion of the Institute to a down-town building, leaving the heavy laboratories for the time being at 3300 Federal Street.

> An extensive survey of available buildings in or near the loop and of the considerations that would be involved in moving a major part of the Institute down town has led to the conclusion that this is probably not the best solution of our problem.

2. Acquisition of an existing building which would house practically all of the Institute's activities.

**In 1933 the ending of the fiscal year was changed from June 30 to August 31. This amount, therefore, relates to a period of fourteen months.

There are buildings on the near north side which would house comfortably all of the major activities of the Institute, with near-by space available for the balance. One such building and fee can probably be secured for considerably less than a million dollars. If this amount were forthcoming, acquisition of the property in question would be a satisfactory present solution of our plant problem. The location of the property makes it probable from a real estate standpoint that it could be sold without loss after an occupancy of ten or fifteen years.

3. Purchase of a suitable site and erection of new buildings on it.

A large number of available vacant properties have been inspected, and there is one such property which seems especially suitable for our purposes. In order to give a measure of definiteness to the investigation, provisional plans have been drawn without burdening the budget for a main Institute building on the site in question.

All these approaches involve provision either for an early disposition of our present property or else turning it to some income-bearing use. With this thought in mind steps are being taken to ascertain what profitable use might be made of the property by an eleemosynary foundation or by some public body, but they have not yet proceeded far enough to indicate where they may lead.

It is recommended that the Board of Trustees take official action to insure an early and thorough exploration of the subject of a future site.

Contemplated Self Support

Progress to date with the development of industrial research, the encouraging pick-up in evening school registration, and a net increase of about $25,000 from a fifty dollar increase in tuition, suggests that the Institute is well on its way to self-sufficiency, in respect to its normal educational program even after these years of depression. Our present plant places a fixed limit on attendance, but the deficit of $50,000 this year compared with the vastly greater deficits of past years registers distinct progress in the direction of self-support. It is probable with a plant capable of carrying the load that day registration could soon be stepped up to cover 1,000 students without changing the general character of the school or impairing the quality of the student body; nor would such a moderate increase be likely to overstock the market for graduates.

A suitable plant would also permit the development of a well-rounded summer school and the expansion of the evening school to provide for a comprehensive program of adult education. These developments in themselves, without the aid of industrial research, which a favorable location and plant would greatly stimulate, would easily carry their own load and provide the necessary teaching staff to reduce the present emergency overload on the faculty.

Future Opportunities

In approaching these questions of the future, our location in the industrial capital of a great empire is an outstanding asset. With a population of some five million within commuting distance and with the advantages which accrue to students from securing their engineering education in an important industrial, scientific and technical center, the potential community service of a large engineering school like Armour with its entrenched goodwill is difficult to measure.

Even with relatively high tuition, the great majority of our students are receiving their education at a cost which they could not begin to match at a school so located that they would be compelled to live away from home. Eighty to ninety percent of Armour students year in and year out come from the immediate metropolitan area. The fact that twenty-five percent of them regularly earn all or a part of their tuition and that many of them earn their entire expenses is an indication of what it means to these young men to have such a school at their doors.

In these circumstances, it is unthinkable that the leaders of Chicago business and philanthrophy will take so short-sighted a view of their own interests as to fail to meet these young men, and those who are to follow them, at least half way. Meeting them half way involves underwriting the present modest deficit and it involves also providing a suitable plant in which to operate.

Covering the deficit can easily be accomplished by contributions from a considerable number of men of moderate resources, like many of those who have already contributed. Provision for a new plant will probably require the tapping of somewhat more concentrated wealth. With the Institute as now organized and directed, any one who builds a monument in the form of an endowed physical plant for it may do so in full confidence that it will not require other large contributions to provide for current operation.

In spite of momentary difficulties the members of the staff are assured that the outstanding ability and resources resident in the Board of Trustees will be amply equal to the task in hand, and that others who have the interests of Chicago at heart will come to their aid, once the significance of the Institute in the life of this community commands their attention.

Providing a plant and establishing instruction on a cost-of-service basis will put the future of the Institute beyond jeopardy, but it will not exhaust opportunities for service by public spirited citizens. An important adjunct of cost-of-service operation should be provision for adequate scholarships and loan funds.

Scholarships

For some years Armour awarded one freshman scholarship to each public high school in Chicago. Since 1933 freshman scholarships have been

awarded by competitive examination held at the Institute in May. Competition for these scholarships is now open to students from accredited high schools regardless of location; in 1934 two scholarships were awarded to students outside of Illinois.

Competitive examinations result in securing high grade students and the publicity connected with them is also advantageous. Nearly two hundred students entered the competition this year. The cost of these scholarships is borne by the regular budget. There is great need of endowment for these and additional scholarships available for freshmen.

The Institute has a small endowment for scholarships available for upper classmen, but there has been such a shrinkage of income from the funds that only three half-scholarships to seniors could be awarded for 1934-35. It is hoped that this condition may soon be remedied by additional scholarship endowments.

For several years a group of fire insurance companies, acting through the Western Actuarial Bureau, has awarded scholarships covering tuition and fees for four years in the Department of Fire Protection Engineering. Eight such scholarships were awarded in 1933 and the same number in 1934. The total number now in effect is thirty-three. Beginning this year the value of these scholarships was increased to cover the full cost of instruction. This increase generously recognizes the fact that the regular tuition is far below that cost.

Funds for scholarships in all departments from now on should cover the full cost of instruction. There is no more fruitful way in which generous individuals can support higher education than by meeting the full cost of instruction for students, who, through competitive examination or otherwise, show themselves worthy of such aid. Encouraging persons of means in underwriting a course of study for promising students should become an important item in our financial program.

Student Loans

In many cases it is more desirable to assist students by means of loans than through outright stipends which do not require repayment. As higher education is gradually placed on a cost-of-service basis it will become increasingly essential to provide adequate loan funds for students whose records make them good risks. About the only sound criticism that can be made against the cost-of-service basis for financing education is the fact that worthy but inpecunious students cannot unaided bear this cost. From the standpoint of the community and of the motives assumed to dominate private philanthrophy it is highly important that opportunity for higher education in privately controlled schools should not become an exclusive privilege of the well-to-do. This danger may be forestalled through scholarships

for students of exceptional merit and through adequate loan funds for students of distinct ability and promise to whom scholarships are not available.

At Armour the Faculty Loan Fund, the Alumni Association Loan Fund, and the Henry Strong Educational Foundation have for some time helped materially in making it possible for worthy students to continue in school. In the fall of 1933 the Armour Tech Athletic Association voted unanimously to make a considerable portion of its surplus funds available for student loans. A general Institute Loan Committee, under the able chairmanship of Professor Benjamin B. Freud, has recently been created to supervise the granting of loans and to unify practice and procedure in this important branch of Institute administration.

The history of loan funds, both at Armour and elsewhere, indicates that when loans are judiciously made and sound business procedure is consistently followed in making collections, losses become negligible. Assuming that periods of relative social stability will recur in the future as they have in the past, a student whose record justifies him in having faith in himself and his future may regard properly budgeted borrowing for an education as a sound investment. Public spirited individuals with available funds may likewise regard investment in an interest-bearing student loan fund as sound.

It may be that the Board of Trustees will wish to consider the organization of a separate corporation as an agency for securing and administering a foundation to provide loans for Armour students. Be that as it may, it is earnestly recommended that they include provision for an adequate loan fund as an important item in their financial planning.

Board of Trustees

The Board of Trustees has been materially strengthened during the past year by the following additions to its membership: Alfred L. Eustice; Edwin O. Griffenhagen; Howard L. Krum; George S. Allison; Homer H. Cooper; George I. Haight; and James O. McKinsey. Messrs. Eustice, Griffenhagen and Krum were designated by the alumni.

The membership of the standing committees is as follows:

Executive Committee

James D. Cunningham, Chairman

Alfred S. Alschuler	Chas. W. Hills, Jr.
Homer H. Cooper	Willard E. Hotchkiss
George I. Haight	Sterling Morton

Instruction and Research Committee

James O. McKinsey, Chairman

Alfred L. Eustice	Ernest A. Henne
Robert B. Harper	Russell Wiles

Public Relations Committee

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John J. Mitchell
William S. Monroe
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Recognition

It must be recorded that two distinguished members of the Board of Trustees have been taken by death during the past year. Mr. Lester L. Falk died only a few days after the annual meeting a year ago; and Mr. Leo F. Wormser was killed in an automobile accident during the past summer. Appropriate resolutions of sympathy and of appreciation for the great service these men have rendered have been passed by the Board of Trustees, presented to the families and associates of these deceased members and made matters of permanent record.

This report should not close without an expression of appreciation for the services which the Board of Trustees, its Chairman, and the members of the Executive, Development and Public Relations Committees have rendered in keeping the ship afloat in heavy seas. Appreciation is also due to the Alumni Association under the presidency of John J. Schommer for the manner in which many difficult problems have been met and advanced toward solution.

Recognition is due and overdue to the members of the faculty who under the most disquieting conditions have preserved a scholarly poise and have assumed cheerfully the added burdens which it became necessary for them to carry. The faculty has collaborated in every possible way with the administration and the Board of Trustees in helping to direct the course of the Institute so that the present difficulties may work no loss of vitality nor impairment of educational results.

Another source of encouragement, tempered with inevitable regret, is the way in which some of the members of the faculty who have had to be placed on a part-time schedule and even some of those whose appointments could not be renewed have recognized the exigencies of the situation and expressed their loyalty. Such evidence of devotion makes it all the more a matter of keen regret that during past years no provision was made for continuing stipends to members of the faculty who are retired. It is hoped that

at an early date our plans will have so far progressed that this crying need may be met.

Among those whose services should be particularly recognized in this report is our Treasurer. With unfailing fidelity and zeal he has conserved our scanty resources. He has also shown consummate skill during this period of deep depression in granting students necessary indulgence in their payments. He has followed deferred payments with such friendly persistence in collections that losses have been negligible. With concessions made to more than twenty percent of students last year and with over-due bills amounting to nearly $14,000 at one time, the amount still uncollected is less than $500 and most of this will be paid. Concessions in payment this year are being made to over twenty-five percent of the students without any serious danger of important losses.

On the strength of this record and of his long service and devotion to the Institute, on recommendation of the President and the Executive Committee, the Board of Trustees has constituted the Treasurer as the Endowment Officer of the Institute. In this capacity it will be possible for him to aid greatly the Executive and the Public Relations Committees in securing ways and means by which the Institute may forge ahead.

In order that the Treasurer may be able to discharge his new responsibilities the Trustees have created the office of Comptroller to be filled by a properly qualified person directly responsible to the President. It is not contemplated that this change will cause any net burden on the budget.

On recommendation of the President and the Executive Committee, and in view of their long and valuable service to Armour Institute of Technology, the Board of Trustees has voted that Thomas E. Doubt, George F. Gebhardt, Charles W. Leigh, and Guy M. Wilcox be awarded the rank of Professor Emeritus and be carried on the rolls of the Institute with that rank.

Respectfully submitted,

WILLARD E. HOTCHKISS,
President.

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ARMOUR INSTITUTE
OF TECHNOLOGY

President's Report

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Year Ending August 31, 1935

Chicago, Illinois

Message to Alumni:

The following report for the year ending August 31, 1935, continues the record of events and plans for the future which were embodied in the President's report sent to alumni in the fall of 1934. Appended reports by the Dean, the Director of Research and Testing, and the Director of Physical Education contain a fairly complete story of current events.

Perhaps the most important educational event of the year is the reestablishment of shop courses with Dr. William A. Pearl in charge. Dr. Pearl comes to Armour from the Benson Polytechnic School of Portland, Oregon, where he was head of the Engine and Aeronautical Departments. Before going to Portland, he took his doctorate in Mechanical Engineering at the University of Michigan. His undergraduate work was done at the State College of Washington. He was for several years a master machinist at the Bremerton Navy Yard. From the standpoint of his engineering scholarship, his skill as a master mechanic, and his demonstrated ability as a teacher, he is well equipped for the kind of work which shop courses at Armour require.

Alumni will be interested in efforts that are being made to promote, within the several options, certain distinct types of study, some of which are enumerated under the heading "Opportunity for Special Financing". The fields mentioned include Metallurgy, Aeronautics, Air-Conditioning and Refrigeration, Automotive Engineering, Sanitary Engineering, and Soil Mechanics. The Library, individual professorships and funds for salaries and retiring allowances are noted as advantageous subjects for special endowment. The desirability of permanent financing for each of the engineering options and architecture is also urged. Particular emphasis is placed on the need for endowing scholarships and loan funds. All of the special lines of activity here mentioned constitute a part of a general program of development including undergraduate work, graduate study and research.

The administration and the Board of Trustees desire again to express appreciation for the cooperation of alumni and the help they have given, individually and collectively. Many alumni, during the year, have discussed current problems with the President and members of the Board of Trustees and staff; these conferences have been uniformly beneficial. All those who are active with the day to day problems of administration on the campus hope that in the year to come a still larger number of students of former years may be able to visit the Institute and give the officers the benefit of their counsel.

WILLARD E. HOTCHKISS.

ARMOUR INSTITUTE OF TECHNOLOGY

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ARMOUR INSTITUTE OF TECHNOLOGY
PRESIDENT'S REPORT
Year Ending August 31, 1935

To the Board of Trustees:

A preliminary report was distributed at the spring meeting of the Board of Trustees on May 27, 1935, and a supplementary oral report was made at the annual meeting on October 14, 1935. The Dean, the Director of Research and Testing, and the Director of Physical Education have prepared reports, which are attached hereto. Together, these reports cover current activities, aside from finance, in considerable detail. The Dean's report concludes with a list of carefully considered recommendations, to which the President subscribes.

Financial Review

Appointment of a Controller

At the annual meeting on October 15, 1934, the Board of Trustees adopted a resolution creating the office of Controller. The position was to be filled at the discretion of the President, under certain conditions to be determined by the Executive Committee. Consideration of various financial problems of the Institute led the Executive Committee, later in the year, to pass a resolution directing the President to proceed with the appointment of a Controller and indicating, pursuant to the resolution of the Board of Trustees just mentioned, the general outline of duties which the Controller should perform. Mr. James O. McKinsey and Mr. George W. Rossetter of the Board of Trustees, Mr. Arthur Andersen and others were of great assistance in making the selection. Mr. Wallace Flower, a member of Mr. McKinsey's staff, was chosen for the position and took up his duties on May 15, 1935.

Reports of Treasurer and Controller

At the annual meeting held on October 14, 1935, the Treasurer presented a report outlining the procedures which have been followed during the depression in granting necessary deviations from the rule providing for advance payment of tuition and fees. The consideration and skill with which this matter has been handled has reduced to a minimum the number of qualified students who were prevented by lack of funds from securing an engineering education at Armour, and losses have been negligible.

The Controller's report reviewed the financial operations of the fiscal year 1934-35 and described the status of investment accounts and steps taken to insure the more efficient servicing of both bonds and mortgages. It also included the budget for the current year, which the Board of Trustees approved.

Financing During the Past Decade

In years past, by far the largest sums required to supplement operating income in maintaining the Institute, were contributed by the founder and members of his family. The President's report a year ago, which was published and distributed to trustees, alumni, faculty, and friends, called attention also to gifts of nearly one million dollars made by friends of the Institute and by alumni, faculty, and students, since July 1, 1926. Of this amount, some $50,000 or $60,000 was raised specifically to cover the work of the Development Committee. A special gift was also made at the beginning of the present administration to cover a survey made by Mr. James O. McKinsey in the winter of 1933.

The gifts of nearly a million dollars, just mentioned, were for the most part contributed to a sustaining fund raised for the purpose of meeting operating expenses for the five year period ending June 30, 1931, insofar as these were not covered by income from fees, services and investments. This difference between income from these several sources and total expense has been commonly referred to as the operating deficit. The amount raised to carry so-called deficits for five years to June 30, 1931, actually carried them for seven years to June 30, 1933. This fact is evidence of the careful manner in which funds were expended during this time.

The McKinsey study just mentioned contained as complete an analysis as possible of all operating and development problems with which the Institute was confronted. Expenditures and sources of income were subjected to careful scrutiny in relation to operating efficiency and to basic educational objectives. Although in no sense confined to finance, the study took account of the necessity of placing both immediate and long-time finances of the Institute on the soundest possible basis. The substantial economies which followed the survey demonstrated the need for making it. However, since these economies involved important educational questions, it was essential to avoid acting prematurely and therefore many of the measures indicated were first embodied in the budget of 1934-35 and some of them were postponed until the current budget. The funds used for covering the difference between expenditures of all kinds and receipts from students, from services, and from investments, year by year, since July 1, 1926, have been as follows:

1926-27	$148,600
1927-28	146,700
1928-29	136,200
1929-30	143,300
1930-31	147,700
1931-32	165,800
1932-33	144,700
1933-34	129,000
1934-35	50,000*
1935-36	40,000*

* Budget figures, see text page 9.

Because in 1933, the ending of the fiscal year was changed from June 30 to August 31, the $129,000 shown for the year 1933-34 covers a period of fourteen months. Part of the improved financial showing for 1934-35 and 1935-36 was the result of an increase of $50.00 a year in tuition, which became effective September 1, 1934. In 1934-35 certain items of expense, including additions to retirement stipends, were voted after the budget was presented at the annual meeting in October. These items increased the amount of financing required by about $5000 over the $50,000 shown above. On the other hand, expenditures were curtailed later in the year, so that actual financing was considerably less than $50,000. The economies in question applied only to the fiscal year 1934-35.

The relatively favorable showing for the current year, as compared with the budgeted amount for 1934-35, is in part the result of economies of a type indicated by the McKinsey report, some of which are temporary, but in considerable measure it reflects an expansion of the evening school as result of certain changes in policy, which are outlined at length in the report of the Dean.

The period of ten years since 1926, which will come to an end with the current academic year, has been in large measure a period of taking account of stock preparatory to the next forward move. It was perhaps to be expected, during such a period, that the financing of the Institute would proceed upon a more or less temporary basis. In these circumstances, it is gratifying that, during the past decade, appreciative alumni have joined with other friends in furnishing the funds to carry the Institute through an important transition period. This is especially significant when it is recalled that two-thirds of this period was one of extreme business depression.

The substantial progress which has been made in approaching the long-time objectives embodied in the Armour Development Plan and in the McKinsey report have materially simplified the problem of current financing. However, it is obvious that not only our long-time but our short-time objectives merit careful and prompt attention by the trustees, both individually and collectively.

Program for the Future

Undergraduate Work

The President's report a year ago referred to the premise upon which Armour's educational program proceeds, in this language:

"This premise assumes a four-year undergraduate college of Engineering and Architecture in which students are given opportunity to qualify as beginning practitioners in their professions, and at the same time are able to secure such fundamental education as will promote their growth and aid them in discharging whatever responsibilities their native talents, training, and opportunities may bring."

Graduate Study

Supplementing a well balanced undergraduate course, it is essential to offer a comprehensive program of graduate work. A considerable proportion of students who have maintained high undergraduate records should carry their college work beyond the point that can be reached in an undergraduate course. Steps are under way for the progressive development of graduate study in both Engineering and Architecture. The Dean's report outlines in detail steps which have led to the setting up of an administrative committee, under the chairmanship of Professor Freud, to administer graduate work.

Research

At the May, 1935, meeting of the Trustees, a proposal to establish a research corporation was presented and approved in principle. Since that time, the President, the Chairman of the Board, and members of the staff have severally visited various research laboratories of private corporations, foundations and engineering schools, and have conferred with outstanding leaders of engineering research. The results of these conferences have recently been embodied in a document in which details of organization and proposed policies are set forth. The tentative draft is now being reviewed by a selected list of distinguished scientists, engineers, and administrators, and plans are being perfected for having a carefully considered research program ready for action as soon as other closely related projects are in a position to advance.

Relation of Research to Graduate Study

The preliminary draft of a proposal for a research corporation, to which reference was just made, places particular emphasis upon the necessity of maintaining the closest possible coordination between research and graduate study. It is assumed that research personnel of any foundation established will participate in graduate teaching at the Institute. At the same time, it is expected that, as far as practicable, the subject matter of research work will be made available as thesis material and otherwise for students pursuing graduate study.

Teaching and Research Personnel

Essentially similar types of teachers are required for the most advanced undergraduate work and the early stages of graduate work. It is our policy in recruiting personnel to secure men of outstanding ability as teachers who, at the same time, are competent to conduct graduate instruction and research. A majority of the persons added to the staff during the past few years, besides holding the highest degree given in their respective fields, have shown evidence of notable ability in teaching and research by successful work for educational, public, business, or engineering concerns.

Opportunity for Special Financing

Expansion of graduate study and research will give occasion to develop several new fields of instruction and to strengthen work now being done in other fields. Moreover, there are certain incidents to effective teaching in all fields, each of which necessitates substantial expenditures from year to year. Following are some of the projects for which provision could advantageously be made through special financing:

Metallurgy

The Dean in his report recommends that prompt steps be taken to expand instruction in Metallurgy. Notwithstanding the great importance of metal industries in this area, there is in Chicago no adequate provision for advanced teaching in this field. In order to avail ourselves of practical and scientific experience, we are seeking the cooperation of leaders of research in the metal industries. There is probably no field in which fundamental research and graduate study promise more fruitful results.

Aeronautics

Armour was one of the first schools in America to offer advanced courses in Aerodynamics and Airplane Design. In view of the interest which men of substance in Chicago, including members of our own Board of Trustees, have in this frontier field of transportation, it would be peculiarly appropriate to develop a well-rounded school of aeronautics at Armour. Such a school properly endowed should have every opportunity to become a center of aeronautical teaching and research.

Air-Conditioning and Refrigeration

This is another pioneer subject which is of increasing importance in the development of Engineering. There is great need for advanced study and research in this field, in order that engineering practice may be constantly improved. Equipment and personnel should be provided at an early date for placing our teaching and research in this branch of engineering on the strongest possible basis.

Automotive Engineering

The ability and vigor with which Professor Roesch has developed our automotive laboratory has, for many years, made Automotive Engineering an outstanding feature of the Armour curriculum. Special diligence during the past year has resulted in material additions to laboratory equipment, including three Diesel engines. There is urgent need for still further equipment. Endowment of this phase of teaching and research would be a contribution of inestimable value.

Sanitary Engineering

The appended report of the Dean refers to the experimental water treatment and filtration plant which Professor Vagtborg, assisted by advanced students, has established at Armour. This plant is a complete operating unit, especially adapted for research. It is essential that the progress already made in this field be so adequately financed that its progressive development on the high level attained may be insured for the future.

Soil Mechanics

Another branch of Civil Engineering, in which Armour has opportunity to do pioneering in both teaching and research, is Soil Mechanics. For comparatively moderate expense, the laboratory equipment required for the adequate development of this new field of instruction could be provided. Permanent underwriting of this subject would bring valuable returns.

Library

Although necessary economy measures during the depression have not interrupted moderate library appropriations, other needs frequently make a more dramatic appeal than the mere purchase of books. It is especially important that definite funds be set aside to insure the adequacy of future appropriations, and the library should be enlarged to provide for study rooms and other necessary appointments. A special endowment to finance these requirements would serve an extremely useful purpose.

Endowing Professorships

A form of contribution which benefactors of educational institutions have frequently found attractive is the endowment of professorships in particular subjects. This form of gift would, of course, be applicable to all of our major departments and to special lines of work like those just enumerated. Such endowments would constitute not only a service to Armour but to the engineering profession and to the community.

Salaries and Retiring Allowances

The Dean's report urges the need for raising the level of salaries. The importance of doing this at the earliest possible moment is obvious. A few years ago, the efficiency and morale of a neighboring school were greatly heightened by a large endowment made by a prominent Chicago business man for the specific purpose of raising salaries. Such an endowment, in our case, could also wisely provide for continuing stipends to be paid to members of the faculty when they reach the age for retirement. An endowment for these purposes would not only provide security, to which members of the faculty are richly entitled, but it would be of inestimable value in recruiting new personnel.

Budgeting Special Needs

Members of the administration and staff interested respectively in the special subjects just enumerated and others of parallel significance have budgeted requirements in these several fields. Particular attention is directed to the opportunity offered to underwrite and endow any or all of these activities.

Departmental Requirements

Advanced work in particular subjects and provision for services of the kind mentioned above are predicated upon sound development of teaching and research in the basic engineering options and architecture. Equipment and personnel needed for undergraduate and graduate study are conditioned to considerable extent upon the present status of the respective departments and the distribution of enrollment between them. Taking account of these and other factors, the several directors have prepared careful budgets of their immediate and long-time needs. The purpose of these budgets is to furnish a basis for permanent financing in the form of endowment or other guaranteed income.

Chemical Engineering

Armour has consistently maintained its leadership in this field since the department was established in 1901. Because of this leadership and of the extraordinary development of chemical industries, enrollment in the department is higher than it has ever been, and the option is now considerably overcrowded. Permanent financing of Chemical Engineering must provide the funds required for necessary equipment, materials, and personnel to take care of increasing registration, both undergraduate and graduate.

Mechanical Engineering

In this option likewise, enrollment is the largest which the department has ever enjoyed. The engineering shops, which are just being reestablished, are an adjunct of this department although, like several other subjects administered under Mechanical Engineering, they serve other departments. Because the mechanical laboratories were well developed in years past, the difficulty of caring for students now enrolled is not as great as in the case of Chemical Engineering. However, the department is in urgent need of several types of new equipment.

Electrical Engineering

Registration in this option has remained relatively constant for a number of years. Because of retirement of some of the older members of the department, there will presently be need for recruiting new personnel, and it will become necessary to incur considerable expense for equipment required properly to develop graduate work.

Civil Engineering

Depression in the construction industries and the resulting unemployment of civil engineers has had a retarding effect upon registrations in the Civil Engineering option in recent years. This condition is not likely to be permanent; basically, Civil Engineering is more important today than ever before. Armour should continue to make significant contributions to educational and scientific advance in this field. Reference to particular phases of Civil Engineering has been made in discussing opportunities for special financing.

Fire Protection Engineering

This course was established in 1903 when Underwriters' Laboratories offered the use of its equipment for development of a basic engineering course in this field. Later an organized group of fire insurance companies provided for a number of years as many as 25 to 30 four-year scholarships each year to enable students to take the course. Because of the depression, the number has been reduced to 8 or 9 new scholarships during each of the past four years, but beginning with the fall of 1934, the value of the scholarships was increased to cover approximately the full out-of-pocket cost of instruction for each scholarship. The records which students in this course have made have resulted in an active demand for graduates. It is hoped that the fire insurance companies will again provide at least the previous number of scholarships as soon as conditions permit.

Architecture

Acute distress in the building industry has resulted in a substantial decline of enrollment in Architecture. However, it is highly important that the Institute keep abreast of significant developments in architectural education. To this end, studies are being made of various movements and experiments in this country and abroad, and a committee of cooperating architects has been organized to promote cooperation with the profession. This committee consists of John A. Holabird of Holabird & Root; Alfred Shaw of Graham, Anderson, Probst & White; C. Herrick Hammond of Burnham Bros. & Hammond, a graduate of the class of 1904 and State architect of Illinois; and Jerrold Loebl of Loebl & Schlossman, a graduate of the class of 1922. Finally, Alfred S. Alchuler, an active member of the committee, occupies the unique position of being an alumnus, a trustee, and a member of the Executive Committee. There is reason to hope that out of the work of this committee will develop ways and means of maintaining the architectural school on a level of distinction corresponding to the importance of the profession in this area.

Scholarship and Loan Funds

Although technically funds for scholarships and student loans constitute a special need similar to those enumerated earlier in this report, the peculiar

significance of the subject necessitates giving it more detailed consideration. Dean Heald, in his report, calls attention to the importance which students are forced to attach to the question of cost in deciding what college they will attend. For students in the Chicago Metropolitan area, Armour of course has a great advantage over schools of comparable standing located at a distance, in that it is possible for students to attend Armour while living at home. In most privately supported schools of high rank, fees from students constitute the largest single source of income. In order to maintain their work on a university level, schools like Armour, and even heavily endowed schools, find it both necessary and desirable to charge much higher fees than are required in colleges and junior colleges which enjoy public support. The practical answer to this and similar problems appears to lie in the appeal which comes from high standards and prestige reinforced with ample funds for scholarships and student loans.

Scholarships and Loans Basically Essential

Education in privately supported schools should not become a class privilege. Experience throughout the country shows that with adequate funds for scholarships for students of distinction, and with revolving loan funds for students of more than ordinary promise, it is feasible for privately supported schools of outstanding rank to maintain their tuition rates on an adequate level without jeopardizing the universality of their appeal to the higher grade of students. In considering the question of scholarships, it is necessary to recognize that, notwithstanding our relatively high tuition, the unit cost of instruction is far greater than the amount which the individual student pays in fees. Endowments for scholarships to cover the full cost of instruction should occupy an increasingly important place in our financial program. Such endowments should preferably be so flexible that the number of scholarships could be adjusted from time to time to the changing cost of instruction.

Need for One-Hundred Scholarships

Accepting the situation as it stands at present, if interest charges and depreciation on plant are excluded, the present average cost of instruction at Armour is about $500 per year as against the tuition charge of $300. Assuming that each scholarship for the time being were to cover approximately the present cost of instruction, $50,000 a year would provide for 100 scholarships. For the freshman year, such scholarships should probably be awarded in the same way that present scholarships are awarded, that is, on the basis of a competitive examination. For the later years, they might be awarded on the basis of the student's record at Armour or jointly on a basis of the record supplemented by special examinations. The 100 scholarships could be distributed among the four undergraduate classes and graduates in any way which sound policy and experience seem to dictate. There is no question of our ability to select 100 men every year who are amply deserving of having the cost of their instruction under-

written in this way. Fifty thousand dollars a year for 100 scholarships would represent an immediate charitable contribution to the youth of this community, the fruitfulness of which it would be difficult to equal.

Isadore Prenner Scholarship

Under a Declaration of Trust, dated July 3, 1930, by Isadore S. Prenner, an alumnus of the class of 1897, certain insurance on the life of Mr. Prenner has become a trust estate for the purpose of establishing a scholarship at Armour Institute of Technology. The scholarship is to aid students, who, because of insufficient means, could not, without the scholarship, attend the Institute. On the basis of present investment of the fund, the income available for a scholarship for the coming academic year will practically equal the tuition of one student. It is not improbable that the amount may later be somewhat increased. The receipt of this trust estate was reported to the Board of Trustees on May 27, 1935, at which time the Board adopted a resolution expressing appreciation for the gift, created a scholarship to be designated as "The Isadore S. Prenner Scholarship," and directed that copies of the resolution be transmitted to the trustees of the fund and to the members of Mr. Prenner's family.

Site and Plant

An early solution of the problem of a future site is imperative. This question was discussed at some length in last year's published report. At the spring meeting of the Board held on May 27, 1935, a project for moving to one of the favorable sites explored was presented in the form of a booklet, entitled "A New Home for Chicago's Center of Education in Engineering and Architecture." The proposal to move was approved in principle and the Executive Committee instructed to explore ways and means. Pursuant to the resolution of the Board of Trustees, continued effort is being made to solve not only the problem of a site, but the closely related problem of obtaining adequate capitalized income so that the Institute may proceed with its development program with assurance of being able constantly to enrich its service.

Board of Trustees

Appreciation is due to the members of the Board of Trustees for the valuable services they have rendered. The Chairman of the Board and the members of the Executive Committee have carried a heavy load and have dealt with many difficult problems with exceptional patience and poise. Two members of the Board of Trustees, Mr. Charles J. Faulkner, Jr. and Mr. George G. Thorp, found it necessary to terminate their service at the end of the year just closed—Mr. Faulkner because of the pressure of other duties, Mr. Thorp because of retirement

and removal from the city. The Board accepted the resignations of these members with keen regret but with sincere appreciation of the loyal and valuable service they have rendered.

On the nomination of the Executive Committee, Mr. Claire L. Barnes, Mr. Newton C. Farr, and Mr. Harris Perlstein have been elected to membership in the Corporation and in the Board of Trustees. Mr. Barnes is a prominent industrialist in Detroit; it is gratifying to have a person of his standing from another community join forces with us. Mr. Farr has already been of great assistance in handling our mortgages and real estate. His position in this field and his qualities of leadership will make him a valuable addition to the Board. Mr. Perlstein is a distinguished alumnus of the class of 1914. He was the first successful producer of malt sugar, and is responsible for the business success of the Company which is utilizing this product.

Mr. Homer H. Cooper, our general counsel, asked to be relieved of his duties as Secretary and member of the Executive Committee, which offices he had filled with conspicuous success. He has been succeeded by Mr. Alfred L. Eustice, a valued and esteemed alumnus and member of the Board. Mr. Cooper remains as a Trustee and as general counsel.

Respectfully submitted,

WILLARD E. HOTCHKISS,
President.

Report of the Dean

To the President:

The following report covers the activities of the school year ending August 31, 1935:

Faculty

Organization

The year just past saw the organization of the Faculty Council, consisting of all professors and associate professors. This group, serving as the legislative body of the faculty and meeting monthly throughout the school year, proved of great value in furthering the aims and activities of the Institute. Numerous committees of the Council have studied specific problems, including placement, evening classes, curriculum, graduate courses, publicity, library, freshmen scholarships, fraternity affairs, student loans, and student publications. Results of these activities are included in this report under appropriate headings.

Appointments and Promotions

New appointments during the year include the following: William A. Pearl, Associate Professor of Mechanical Engineering and Director of Engineering Shops; Harvey O. Snediker, Assistant Professor of Fire Protection Engineering; Arthur S. Hansen, Instructor in Economics; James G. Potter, Instructor in Mathematics; Elder J. Olson, Instructor in English; Henry A. Sager, Instructor in German; Billy Goetz, Instructor in Economics; Alice V. Neil, Assistant Librarian.

Henry P. Dutton, who during the past two years has served as Lecturer in Industrial Management, was made Professor of Industrial Management and Chairman of the Department of Social Sciences, at the beginning of the second semester. Watson M. Davis, Instructor in Mathematics, was promoted to Assistant Professor of Mathematics.

New appointments in evening classes include Norman Schreiber, Lecturer in Industrial Management; LeRoy Shields, Instructor in Heating and Ventilation; John J. Corliss, Instructor in Mathematics; Albert I. Cohen, Instructor in Chemistry; Carl G. Anderson, Instructor in Mechanics.

Resignations

Carman G. Blough, Professor of Economics and Chairman of the Department of Social Sciences, resigned during the year to accept an important position with the Securities Exchange Commission. Other resignations were Kent H. Parker, Assistant Professor of Fire Protection Engineering; W. Bruce Lockling, Instructor

in Economics; Clair C. Olson, Instructor in English; Hanns Fischer, Instructor in Languages; Harriet P. Wirick, Assistant Librarian.

Professional Activities and Recognition

In May, 1935, Professor Ernest H. Freeman was honored by the degree of Doctor of Engineering from Kansas State College in recognition of his distinguished services as an engineering educator.

Society for the Promotion of Engineering Education. For several years Professor Finnegan has been a member of the council of the Society for the Promotion of Engineering Education; he has recently been appointed Chairman of the S.P.E.E. Committee on Relations with Industrial and Trade Associations. Largely on the initiative of the Armour faculty, an Illinois-Indiana Section of the Society was organized at a Spring meeting at Purdue University, and Professor Finnegan was elected the first President of the Section. Papers were presented before this Section by Professors Dutton, McCormack, Stevens, and Ensz. During the coming year, this group will meet in Chicago with Armour as host school.

The annual meeting of the National Society held in Atlanta, June 24-27, was attended by the President, the Dean, and Professors Finnegan and McCormack. President Hotchkiss presented a paper entitled "Social Sciences in Engineering Schools." Professor McCormack gave papers at two sessions, one "The Desirability of a Laboratory Manual in Chemical Engineering," and the other, "Design of Chemical Engineering Laboratory Equipment." Professor Finnegan led a discussion on the proper procedure in shop courses. All of these contributions are published in the proceedings of the Society.

Other Engineering Societies. Several members of the faculty have taken an active part in the Western Society of Engineers. Professor Peebles presented a paper on insulating materials to one of the Fall meetings. Mr. Setterberg has served as Chairman of the Junior Section of the Society for the past year, and the Dean has been Chairman of the Publications Committee and of the Education Committee.

Professor Freeman has participated in the work of the Chicago Section of the American Institute of Electrical Engineers, as Chairman of the Education Committee. He also attended the annual meeting of this Society at Ithaca in June. Professor Libby has served for several years as Chairman of the Education Committee of the Society of Practical Refrigerating Engineers, and he attended the annual meeting at Springfield. Professor McCormack attended the semi-annual meeting of the American Institute of Chemical Engineers at Wilmington, presenting a paper on "The Objectives of Laboratory Instruction in Chemical Engineering." Professor Carpenter spoke on the program of the Chicago Section of the American Institute of Mining Engineers.

Architecture. Members of the faculty of the Department of Architecture participate in the work of the American Institute of Architects and the Illinois

Society of Architects. Professor Reed has served in an advisory capacity in connection with Federal Housing activities, and he has conducted a historical survey of early Illinois architecture. Professors Reed, Beersman, Bentley, McCaughey, and Suter represented Armour at the Milwaukee meeting of the American Institute of Architects, and the Associated Collegiate Schools of Architecture during the Spring.

Science and Mathematics. Professor Thompson and Dr. Oldenburger represented the Institute at the December meetings of the American Association for the Advancement of Science at Pittsburgh, where Dr. Oldenburger presented a paper before the American Mathematical Society. Professor Krathwohl has served during the past year as President of the Men's Mathematics Teachers' Club of Chicago. Professor Thompson is President of the Chicago Section of the American Association of Physics Teachers. Professor Freud continued his important activity in the Chicago chapter of the American Chemical Society. Dr. Barr attended the national meeting of this Society at San Francisco in August. Professor Carpenter presented papers at meetings of the Astronomical Society and of the Amateur Society of Telescope Makers.

Public Activities. The Institute has been an active member of the Adult Education Council of Chicago for several years. Professor Penn serves as a member of its Board of Directors and Professor Heald as Secretary of the College Committee. During the year, the Council sponsored a radio program on Engineering Education with President Hotchkiss as speaker. The President, the Dean, and Professor Dutton each served as guest lecturer at each of the three Chicago Junior Colleges.

Professor Schommer has made numerous talks during the year before various clubs and civic organizations. President Hotchkiss has engaged in various public activities, and is at present a member of the Chicago Advisory Committee on Housing for the Public Works Administration.

Publications

Aside from papers read at meetings of professional societies and later published, as already noted, there have been numerous other publications by members of the faculty. Important in this list is the "Report on Shop Policy," which, as noted elsewhere, is serving as a basis for reestablishment of engineering shops. The committee by which this report was prepared consisted of Professors Finnegan (Chairman), Huntly (Vice Chairman), Freeman, Heald, and Tibbals.

Professors Libby and Roesch have published respectively class notes on Refrigeration and on Diesel Engineering. Professors Hammett and Seegrist have collaborated in publishing a "Supplement and Guide for Elementary Machine Drawing," and a similar work for mechanical drawing. Professors Seegrist and Swineford have jointly published pad and form sheets for Descriptive Geometry.

Professor Nachman published an article on "The Steam Jet in Refrigeration," in the May number of Armour Engineer. In the March number of the Engineer appeared an article by the Dean on "Recent Developments in Engineering Education at Armour."

An article by Professor Vagtborg, entitled "Experimental Water Plant Gives Great Flexibility," appeared in the Engineering News-Record for September, 1934. This article discussed the operation of an important adjunct to advanced study in Sanitary Engineering, which has been recently installed at Armour, under Professor Vagtborg's direction.

In the February, 1935, issue of Chemical and Metallurgical Engineering appeared an article by Professor McCormack on "Applications of Chemical Engineering." The same issue contained commendatory editorial notice in reference to the article and to the distinguished work in Chemical Engineering education which is being done at Armour under Professor McCormack's direction.

In connection with the work of the American Society for Testing Materials, Professor Paul has published materials on engineering specifications. McGraw-Hill Company has issued during the year a textbook by Professor Mangold on "Practical Mechanics of Motion."

In the field of Mathematics, Professor Bibb published an article in the Mathematics Teacher for April, 1935, entitled "Interesting Detours in Algebraic Instruction." In Volume 35 of Annals of Mathematics, two articles by Dr. Oldenburger appeared, entitled respectively "Composition and Rank of N-Way Matrices and Multilinear Forms" and "Composition and Rank of N-Way Matrices and Multilinear Forms (Supplement)." An article on "Transportation of Indices in Multiple-labeled Determinants," also by Dr. Oldenburger, was published in Volume 41 of the American Mathematical Monthly. Also by Dr. Oldenburger, was a brief article entitled "Canonical Triples of Bilinear Forms" in Tohoku Mathematical Journal, September, 1934.

Professor Dutton of the Social Science Department, who is also Associate Editor of Factory Management and Maintenance, published articles in this journal during the year, entitled respectively "Foremen Training," "Production Control," "Stores and Inventory Control," "Quality Control," "A Budget So Simple Shop Men Understand It," "Small Business Not Down and Out," and "Courting Labor Trouble." Mr. Hansen, of the same Department, published an article, entitled "Social Security as a National Policy" in Commerce for September, 1935, and one entitled "The Essential Provisions of the Social Security Act" in the September issue of Manufacturers' News.

Enrollment

During the past year a total of 837 students was enrolled in day classes, representing an average of 788 students each semester. This is a slight decrease

from the previous year, but it still taxes our educational plant nearly to capacity, and represents a gratifying attendance in view of the $50 increase in tuition, which became effective in September, 1934.

Distribution of Day Students. Although no changes have taken place in total enrollment during the past few years, there has been considerable readjustment in the distribution of students among the various options. The Department of Fire Protection Engineering has decreased, because of the small number of scholarships which have been offered, and has this year only 39 students in the three upper classes as compared with 70 students in 1931. A somewhat similar situation has existed in the Department of Architecture, where there has been a steady decline in enrollments since 1932. The enrollment in Civil Engineering has decreased from 116 in 1933 to a low of 89 in the present semester. Enrollment in Electrical Engineering has remained fairly constant, with the same enrollment in 1935 as in 1932. The number of students in Mechanical Engineering has been increasing, and this year's enrollment of 134 in the three upper classes is the all-time high for this Department. The Department of Chemical Engineering has shown a steady increase over the last five years and now has in the Senior, Junior, and Sophomore years an enrollment of 132 as compared to 74 in 1931.

These readjustments in the distribution of students among the various options have resulted in some rather difficult problems, particularly in Chemical Engineering where laboratory facilities are quite limited. So far, students have been permitted full latitude in the selection of their options, but any further increase in Chemical Engineering will be impossible unless facilities can be augmented.

Enrollment of Freshman students this year is slightly less than in the previous year although the number of students entering the Institute with advanced standing from junior colleges and other institutions has been somewhat greater. This tendency may be expected to continue since there are in the Chicago area about fifteen junior colleges which offer instruction in the first two years' work of the engineering course at tuition charges ranging from practically nothing, in the case of the public junior colleges, to a maximum of about one-half Armour's rate. While these institutions lack the advantages of a complete engineering school like Armour, they do appear attractive to a prospective student on a basis of the cost of attendance, which has been a particularly important item in the selection of colleges in recent years.

Evening School Enrollment. Enrollment figures for the Fall term show a gratifying response to the enlarged scope of our evening courses. The number enrolled in the evening classes during the Fall of 1934-35 was 638 compared to 438 in the Fall of 1933, and 370 in the Fall of 1932. Advance registrations for 1935 are 822. This rapid increase in evening enrollment is doubtless in part an indication of business recovery, but in a large measure it has been brought about by an amplification of the evening school program. New college credit

courses, which are just starting, have attracted about 100 students. Inasmuch as many of the registrants will carry a prescribed program over a period of four or more years, this number may logically be expected to build up during the next few years. The new course in Diesel Engineering is responsible for about 40 students, and the course in Industrial Management for about 25 others. There are few graduate students enrolled in the evening classes. Further development of graduate courses, which is now under way, may be expected to bring about a substantial increase in attendance.

Summer School Enrollment. There was an attendance of 212 students in the summer session of 1935, or an increase of nine per cent over 1934.

Total Enrollment. All told, the Institute served 1700 individual students during the academic year of 1934-35.

Curriculum

Engineering Shops

The most significant development in the engineering curriculum during the year consisted in the completion of plans for the new shop courses to be initiated in September, 1935. Following the submission of the final report of the Committee on Shop Policy, the courses of study in Mechanical and Electrical Engineering were revised to permit the introduction of the new shop courses in the Junior and Senior years. Shops will also be given in the Senior year of the courses in Chemical and Fire Protection Engineering, beginning in September, 1936. Although the old shop courses have been suspended for two years during the reorganization period, the introduction of the new courses at this time assures that no student will graduate from the Institute without adequate instruction in this important field.

As previously mentioned, Professor William A. Pearl has been appointed Director of Engineering Shops, and he is now actively engaged in developing a modern program for this work.

Graduate Courses

A committee of the Faculty Council, headed by Professor Freud, carried on a thorough study of post-scholastic degrees and graduate courses throughout the year. The Council adopted the recommendations of this committee with reference to the requirements for professional degrees, and at the last meeting of the year endorsed a statement of policy presented by the committee, looking toward the future development of post-graduate work at the Institute. In accordance with this policy, a small administrative committee, consisting of Professors Freud, Chairman, Freeman, and Peebles, has been appointed to further the development of graduate courses in both day and evening classes, and to focus attention on this important field of activity.

New Courses

The Department of Physics has offered new courses in Heat and Radiation and in Light during the past year. Both of these courses have been elected by as many students as could be accommodated in the laboratory. A new elective, undergraduate courses in Soil Mechanics is being offered by the Department of Civil Engineering. This represents something of an innovation inasmuch as few institutions are offering undergraduate instruction in this rapidly developing field. The Department of Mechanical Engineering is offering a special course in Diesel Engineering for the first time in the Fall of 1935.

Evening Courses

The Committee on Evening Class Instruction presented to the Faculty Council recommendations for important revisions in the program of evening instruction in order to present a more attractive opportunity for part-time study. This new plan provides in general for the following three distinct types of well integrated evening programs:

(1) Special sequence courses in engineering and architecture for adult students not interested in college credit or degrees, but who wish to secure adequate training in various branches of engineering or architecture. These courses enable those engaged in technical occupations who wish to extend their education to build up sequence courses in foundation subjects and in a wide variety of technical applications. These courses are in general adapted to the needs of men who have some practical acquaintance with the subject matter and desire work of immediate value. All of these courses are of college grade but some of them do not carry credit toward the degree because of their intensive character.

(2) Courses for high school graduates who desire to cover the first two years of the regular college course in Engineering or Engineering Science in evening and Saturday classes. This work is arranged to make possible the completion of two years of college work in a four year intensive evening program, or may also be extended over a longer period if desired. A few pre-college subjects are offered to provide students an opportunity to remove deficiencies in entrance requirements.

(3) Courses for college graduates of a post-graduate nature to be taken with or without credit towards an advanced degree, depending upon the qualification of the individual student.

Well developed courses of study in groups (1) and (2) are being offered in the Fall of 1935. Although some courses in group (3) will be available, it is hoped that plans can be made during the coming year for a considerable expansion of these offerings. The Institute should plan to make available as rapidly as possible complete facilities for part-time graduate work in engineering in order that this opportunity may no longer be denied to the thousands of engineering graduates in Chicago and vicinity.

New courses to be offered in evening classes during the coming year include Industrial Management and Diesel Engineering.

Scholarship and Loan Funds

Fifteen one-year scholarships were awarded to Freshmen during the year on the basis of competitive examinations given in January and May. 196 applicants competed in these examinations. The work of interviewing candidates, conducting examinations, and awarding scholarships was carried on by the Freshman Scholarship Committee under the direction of Professor Tibbals. The award of one Civic Assembly Scholarship in connection with Chicago Youth Week was continued. Nine students in Fire Protection Engineering were awarded four-year scholarships by the Western Actuarial Bureau.

In spite of the addition during the year of the Prenner Scholarship provided by the will of Isadore Prenner, an alumnus of the class of 1897, funds were available from the endowed scholarships to award only six scholarships to upper class students. There is a great need for additional scholarships of this type and particularly for some scholarships which may be available to Sophomore students.

Loan funds available during the year proved adequate to meet the demands from Junior and Senior students. Repayment of loans has improved materially and several of the funds have comfortable balances to take care of the needs of the coming year. The Loan Committee has, however, been somewhat handicapped in assisting needy students by the necessity of making short-time loans. This makes it extremely difficult to help sophomore students since it is scarcely logical to expect repayment of a loan until after the student graduates. Sufficient funds should be made available to permit loans to worthy students in the second year of college without the necessity for repayment until at least one year after graduation.

Publicity

Systematic effort has been made during the course of the year to bring the Institute more definitely to the attention of prospective students and the general public throughout the Chicago area. The Publicity Committee, with Professor Paul as Chairman, has prepared a large poster illustrating the work of the school, and placed these, framed under glass, in eighteen public high schools and three Junior Colleges in the city. The committee also prepared a pictorial brochure for distribution to individual prospects, and assisted the Registrar in the development of other promotional material.

Practically all public high schools in Chicago and immediate vicinity have been contacted through college day programs or lectures by members of the faculty. Outside of Chicago, alumni have been asked to carry the story of Armour to the local high schools, with good results.

Newspaper advertising has been somewhat increased during the year, and an organized plan for furnishing school news to city and community papers has been perfected.

Some two thousand evening school posters were distributed to about nine hundred firms in Chicago and vicinity. Return postal cards used in combination with these posters resulted in over one thousand requests for information.

The combined results of the various publicity activities brought more requests for information to the Institute than in any previous year of its history. The Registrar reports the distribution of approximately 7500 copies of the General Information Bulletin and 8500 copies of the Evening Bulletin. The large number of inquiries handled by the Registrar, together with an increase in the other duties centering in this office, has proved a heavy load for its staff.

An attractive program of exhibits was presented at the Annual Open House held May 13th, which drew a capacity crowd of about 2400 persons.

Guest Lecturers

The location of Armour Institute of Technology provides excellent opportunities for bringing prominent speakers to the student body. The student branches of the American Society of Mechanical Engineers, American Institute of Electrical Engineers, American Institute of Chemical Engineers, Western Society of Engineers, and the Fire Protection Engineering Society have been addressed by many prominent engineers at meetings held throughout the year. General assemblies have brought before the entire student body a distinguished list of speakers on topics of general interest.

The Commencement Address was delivered on June 13th by Dexter S. Kimball, Dean of the College of Engineering at Cornell University.

Students and Student Activities

Armour students have always been characterized by earnestness, a high degree of intelligence, and a definiteness of purpose. The student body during the past year has been no exception, and student accomplishment in the classroom and in extra-curricular activities has been on a high level.

Student Recognition

Junior memberships in the American Society for Metals were awarded by the Chicago Chapter to Richard D. Armsbury, Elmer Renstrom, and Philip Henoch, Senior students in Chemical Engineering. The American Society of Civil Engineers awarded a Junior membership to George A. Nelson, a Senior in Civil Engineering. Two graduate students of the Department of Architecture, Raymond Schwab and Richard Tague, were successful in the competition of interior design for studios for WGN, sponsored by the Chicago Tribune, and they are now executing the murals for one of these studios.

Fraternities

Social fraternities at the Institute have been faced with difficult financial problems during the past few years. Nine fraternities maintain chapters but their combined membership is only about one-half of the membership of ten years ago. During the past year a committee of the faculty, with Professor Moreton as chairman, has studied the problems of social fraternities and developed a plan for a more active cooperation between the Institute and these groups. This plan provides for the submission of regular financial reports by the fraternities and for cooperation by the school in the collection of members' accounts. Although not fully in effect during the last school year, this procedure enabled most of the fraternities to close the year in an improved condition.

Musical Organizations and Dramatics

The orchestra and glee club, under the direction of O. Gordon Erickson, added further laurels to an already noteworthy record. Numerous concerts were given by both groups at the school, over the radio, and before civic organizations and schools.

An active group of students working with Professor Hendricks gave several very creditable dramatic productions during the year.

Government Aid to Students

The Federal Emergency Relief Administration provided $1485 per month to furnish part-time employment for about one hundred needy students throughout the year. Numerous projects were developed by members of the faculty for these students and much worthwhile work was accomplished. This proved of considerable value in assisting needy students to remain in school. The selection of students, assignment to projects, and general administration of this program was in charge of W. N. Setterberg, Personnel Officer.

Graduate Placement

The Placement Committee, with Professor Peebles as Chairman, working with the Personnel Officer, has been engaged in developing alumni records and adequate personnel data for graduates. Members of the committee, as well as other members of the faculty, have assisted in locating and filling positions.

The Personnel Officer reports a material improvement in the placement of graduates during the past year. Somewhat incomplete records indicate that ninety percent of the 1934 graduates and seventy percent of 1935 graduates have been placed. During the year the Personnel Officer received calls for men from 137 companies and 136 graduates were placed with these organizations. A total of 857 individual students and graduates were referred to positions by this office. It is probable that these figures do not fully represent the extent of the assistance given to students and graduates of the Institute since some members of the

faculty have handled openings coming to their attention without communicating with the Personnel Officer.

Inasmuch as the Personnel Officer has been called upon to administer the F. E. R. A. program, to assist in publicity work, attend college days at high schools, and assist the Registrar and Dean in various ways, the year's record of placement seems particularly significant.

The New Armour Engineer

The Armour Engineer has for many years served creditably as the technical publication of the students of Armour Institute of Technology. In this capacity its circulation has been largely limited to students, faculty, and a few members of the Alumni Association. During the past year plans have been perfected for expanding the scope of this publication and increasing its circulation to include all graduates of the Institute. Under this plan, the magazine will be published jointly by the student body, the alumni, and the faculty. A board of control, consisting of two representatives of each group, has been created to edit and manage the new magazine, and the first issue will make its appearance early in the Fall. The new Armour Engineer promises to be of much greater service to the students, the alumni, and the Institute, and will be extremely helpful as a vehicle for the dissemination of information of interest to all Armour men.

Equipment

Operating on a reduced budget, few major additions to equipment have been possible during the past year. Aside from normal replacements, some new equipment has been obtained for the laboratories in Chemical Engineering, in Metallurgy, in Electrical Engineering, and in Physics. Transfer of the Radio Laboratory to the Department of Electrical Engineering made space available in the quarters of the Physics Department for new laboratories in Heat and Light. The Automotive Laboratory has been augmented by the addition of three new Diesel Engines, and machinery in the Refrigeration Laboratory has been completely overhauled and restored to service. Some additions have been made to the Experimental Water Filtration Laboratory, and a few much needed improvements have been made at the Civil Engineering Summer Camp at Trout Lake, Wisconsin.

Much credit is due to the members of the faculty and employees for keeping the laboratories operating on an efficient basis with a small expenditure of money, but major additions should be made to the equipment in several departments as soon as finances permit.

Summary and Recommendations

Student and faculty morale has been high throughout the school year 1934-35. Instruction has been conducted on a uniformly high level, in spite of the diffi-

culties imposed by heavy teaching schedules, and other significant demands upon faculty time. Accomplishments of the Faculty Council and its committees have been discussed, but several other items merit early consideration:

(1) Teaching loads of faculty members are too high. Present schedules to a large extent obviate the possibility of significant scientific attainments or professional accomplishments by members of the faculty.

(2) Proper provisions must be made for the promotion of younger members of the faculty. Failure to do this will result in the loss of some excellent men to industry and to other institutions. The need for general salary increases is also obvious.

(3) Some consideration should be given to the establishment of an option in Aeronautical Engineering. A number of students are lost to other institutions each year because Armour offers no degree in this field. Laboratory equipment is not now available for this work although the Institute has offered instruction in Aerodynamics and Airplane Design for many years.

(4) Some consideration should be given to the establishment of an option in Metallurgical Engineering. The Chicago area now contains no adequate facilities for instruction in this important field and the Institute should plan to provide thorough undergraduate as well as graduate work as soon as possible.

(5) Further attention should be given to the possibilities for the development of cooperative courses. A preliminary survey made during the year of a limited number of industries indicates a good field in the Chicago area, for a program of this type. Such work might well be started in Mechanical Engineering, supplementing but not in any sense replacing the existing curriculum.

(6) A better integrated student personnel program should be developed. Nearly all organized work of this kind is now carried on by the Dean and Registrar, and the press of other duties does not always permit full consideration of the student's individual problems. Although a great deal of informal counseling is carried on by members of the faculty, it would be desirable to organize this service on a more systematic basis, with complete records for each individual student.

Respectfully submitted,

HENRY T. HEALD,

Dean.

Report of the Director of Research and Testing

To the President:

Rather complete discussion and recommendations relating to plans for extensive development of fundamental and industrial research have been presented elsewhere, and the present report does not contain a comprehensive statement of these plans. However, it is appropriate to point out that many members of the faculty in the limited time available to them, after meeting the requirements of their exacting educational duties, have added to their prestige and to the reputation of the Institute by serving in consulting capacities in the solution of scientific and engineering problems.

During the past school year, commercial research and test work for 147 individual and corporate clients has been carried on. The Institute and its faculty are favorably known for important work in strength of materials, in measurements of heat conductivity of building materials, in water treatment, in metallurgy and metallography, in internal combustion engines, in preparation of rubber compounds, in surface tension phenomena, and in a large number of projects in Electrical Engineering and Physics. Foundation has already been established for much greater activity in the field of research.

Research on the one hand and testing on the other tend to merge into each other in many projects of intermediate character. Furthermore, professional contacts established in the conduct of commercial tests offer a promising approach to the consummation of agreements for true research. We believe that commercial tests and analysis by members of our faculty, using our space and equipment, are desirable, but projects of this nature should not be permitted to interfere with the educational duties which are our primary responsibility. Moreover, the manner of conducting the work should have scrupulous regard to professional ethics and should avoid alienating present or prospective friends by inappropriate competitive procedure. Within these limits, it has been our policy to encourage such work and in this we have conformed to the practice of other engineering schools of high standing.

In general, work comes to us because individual members of our staff have reputations which are known to prospective clients or because the Institute itself is widely known and highly regarded. It appears that the most dignified and probably the most effective means for increasing the amount of work done are precisely the means which lead to greater knowledge and appreciation of the abilities of our faculty. In this connection, at least fifteen articles written by members of the staff have appeared in scientific and engineering journals during the past school year; several others are now in preparation.

This procedure does not preclude such personal contacts and follow-up as can properly be employed in individual cases. As to more tangible methods, such as use of circular letters, and direct advertising in technical periodicals, these procedures appear undesirable as likely to impair the present good reputation of the Institute in the educational field and to antagonize at least some members of the engineering profession. Furthermore, the effectiveness of such methods appears to be doubtful. The reason for submitting projects to us for the payment of fees that are relatively high is, of course, because clients, in many cases, desire the high degree of reliability that may be expected in the work of the specially competent men who are on our faculty.

With only two important exceptions in the past two years, work for industrial organizations has been undertaken not by the Institute itself but by individual members of the faculty who sign reports and render bills in their own name. The Institute's revenue comes from a percentage charge of the fee for engineer's time with additional charges on a basis of cost plus a fair loading for labor and materials. The percentage charge is assumed to cover wear and tear on equipment.

During the past two school years, the average income of the Institute from work in this field has been between five and six times the corresponding income for the year 1932-33. Nevertheless, the receipts from this source constitute only a small proportion of the revenue of the school. Rather more than fifty per cent of our teaching force are definitely not available for such work, either because their professional experience does not qualify them in this field, or because the requirements of our educational program do not enable us to provide them with the necessary laboratory facilities. Of the remainder, many who are teachers of first-rate ability have neither aptitude nor liking for commercial work, or have such heavy teaching programs as to make the assumption of additional duties a matter to be carefully considered from the standpoint of the welfare of the individuals and of the school. Taking into account the limitations stated here, it is still practicable for our staff to handle more work for industry if and when there is opportunity, but there appears to be no reasonable prospect that our income from this source can become of large volume unless there is substantial increase in staff and equipment.

Our records indicate that there are at least 52 commercial testing laboratories in Chicago. We do not feel that we are in actual competition with them, mainly because the fees charged by our staff are several times as large as those of commercial organizations. This comes about partly from deliberate policy, but largely because work at the Institute is done by highly trained engineers, working on various projects as their teaching duties permit, whereas in a commercial testing laboratory a large part of the work can be reduced to a routine which can be followed by a technician who has acquired the manual dexterity needed, but who may not be an engineer, and who is ordinarily paid low wages.

Owners and directors of these organizations are usually competent engineers or scientists, who would charge us with unfair competition if we were to duplicate their methods and match their rather low fees. We count among our assets the good will of the community, including the engineering profession of which our own graduates are a part. Our present policy in the matter of commercial testing does not endanger that good will; complaints about our practice are rare and unimportant; none has come to my knowledge in more than three years. On the other hand, the faculties of some engineering schools have been criticized for the use of their schools' laboratories to enable them to compete on a price basis with commercial organizations. The matter is of such importance that it is scheduled for discussion at the 1936 meeting of the Society for the Promotion of Engineering Education.

Respectfully submitted,

JOSEPH B. FINNEGAN,

Director of Research and Testing.

Report of the Director of Physical Education

To the President:

Inasumch as a report from the Department of Physical Education has not hitherto been attached to the President's report, it may be well to precede the review of the year's events by a statement about organization and purposes.

The program of Physical Education is as varied and comprehensive as existing facilities permit. The policy of the Institute has always been to encourage all students to share in athletic sports, not only because of their immediate benefits but also because of their value in later life. These ends are pursued by means of intercollegiate athletics, intramural sports, and gymnastics. The gymnasium is under the supervision of Mr. William C. Krafft, instructor in Physical Training.

All students undergo a medical examination upon entering the Institute and receive instruction in personal hygiene and first aid to the injured from Dr. John F. McNamara, the medical adviser and examining physician. Freshmen and sophomores are required to take physical training for two hours per week. Contestants for the various athletic teams must submit to physical examination before entering any course of training. Athletic competitions comprise basketball, baseball, track, boxing and wrestling, golf, tennis, swimming, fencing and shooting.

The Armour Tech Athletic Association was formed in 1922 to organize and systematize all interclass relations, to promote interfraternity contests, and to stimulate interest in intercollegiate and intramural athletics. Its membership is limited to the students, alumni, and faculty of Armour Institute of Technology. Management of the Armour Tech Athletic Association is vested in the Board of Athletic Control, which is composed of student and faculty members. Intercollegiate athletics are under the direction of the Board of Athletic Control. Armour Institute of Technology is a member of the Northern Intercollegiate Conference, and competition is scheduled regularly in basketball, baseball, track, swimming, tennis, golf, boxing and wrestling. Members of these teams are voted an athletic award each season by the Board of Athletic Control.

Following is a statement concerning the sports which were carried on during the year 1934-35:

Basketball, with Mr. Krafft as coach, usually had a squad of about 25 men. There were 16 games held during the year, of which Armour won 11 and lost 5. These games were played in the 108th Engineers' Armory.

Baseball, also coached by Mr. Krafft, usually numbered about 30 men. Fifteen games were scheduled, but 2 were called off on account of rain. Of the 13 played, Armour won 6 and lost 7.

The track teams have been coached for a number of years by Mr. Alonzo A. Stagg, Jr., and there are normally about 50 men participating in various types of track athletics. There were 8 track meets during the past year, of which Armour teams won 4 and lost 4. Mr. Stagg resigned at the end of the year and was succeeded as coach by Mr. Norman Root. Ogden Field and the University Field House are used in the autumn, winter, and spring for this activity.

The swimming teams of about 30 men are directed by Mr. E. W. McGillivray, coach of aquatic sports at the University of Chicago. Our teams have the use of the University of Chicago tank. There were 9 swimming meets during the year, of which our teams won 2 and lost 7.

Boxing and wrestling are taught by Mr. Bernard Weissman, who is an attorney. There were 30 men on the boxing squad and 40 on the wrestling squad. There were 12 matches in these sports during the past year, of which Armour teams won 8 and lost 4.

The golf teams, which for many years were directed by Professor Charles W. Leigh of the Department of Mechanics, were, upon his retirement in the summer of 1934, coached by Professor Samuel F. Bibb of the Department of Mathematics. About 15 men participated in this sport. Eleven matches were held during the year, of which Armour teams won 7 and lost 4.

The tennis coach is Professor William W. Colvert of the Physics Department. Our courts were built by the Armour Tech Athletic Association, and are of excellent quality. There were about 20 men in the tennis squad. Seven matches were held during the year, of which 4 were won and 3 lost.

The Rifle Club is sponsored by Professor John F. Mangold. Matches are shot by mail and telegraphic communication. This is a popular activity, and many medals have been won. During the past year, there were 12 matches, of which Armour won 5 and lost 7.

At the Armour Tech Relay Carnival held at the University of Chicago Field House on March 16, 1935, the College Sprint and Medley Relay was won by C. Dunbar, 220; Don Neal, 440; G. Nelson, 220; P. Neuert, 880, to whom individual gold medals were awarded.

In addition to the intercollegiate games and matches, there have been numerous interdepartment, interfraternity, and interclass games in indoor basketball, baseball and track. The gymnasium is in constant use for the various indoor sports. Ogden Feld, which occupies the block directly north of 33rd Street, given to the Institute in 1904 by Mr. J. Ogden Armour, is used not only for physical exercise and as a ball field, but is the scene of many athletic contests, both between different Institute groups and with other colleges.

The new sports started during the past year included fencing and archery. The Board of Athletic Control has now adopted the Freshman Rule which prevents freshmen from competing in intercollegiate games. Under this plan, separate teams will be maintained for freshmen in the various sports during the coming year.

Respectfully submitted,

JOHN J. SCHOMMER,

Director of Physical Education.

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President's Report

Year Ending August 31, 1936

Chicago, Illinois

ARMOUR INSTITUTE OF TECHNOLOGY

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ARMOUR INSTITUTE OF TECHNOLOGY

PRESIDENT'S REPORT

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Year Ending August 31, 1936

Attention in this report will be focused primarily on questions of finance, research, and development. Most of the internal events and activities of the school year just closed are covered in reports by the Dean and Director of Physical Education attached hereto.

Financial and Operating Review

At the spring meeting of the Board held on May 11, 1936, there was presented, and included in the minutes, a somewhat detailed financial review covering comparatively the fiscal years 1933-34, 1934-35, and 1935-36. Expenditures of all kinds exceeded total income from students, from services, and from investments, in the first of these years, by roughly $108,000, compared with a high of $165,000 (1931-32) and a low of $136,000 (1928-29) in the preceding years back to 1926.

Notwithstanding the reduced burden in the year 1933-34, as compared with previous years, the lingering depression made it impracticable to cover the deficit through current contributions. Accordingly, through the able efforts of our general counsel, Mr. Homer H. Cooper, court permission was secured to borrow $100,000 from endowment to meet the 1933-34 deficit.

Reorganizations through which, in spite of depression, the budget of the Institute was brought within manageable proportions, as well as the circumstances attending the court action, to which reference was just made, were outlined at length in the published report of October, 1934. Changes inaugurated at that time were made without impairing educational efficiency and with definite enlargement in the scope of the curriculum and improvement in organization and quality of instruction.

Some of the economies begun in 1933-34 were not fully carried out until the year 1934-35, with the result that we entered that year with

an anticipated deficit of but slightly more than $50,000. Operating income during that year was considerably above budget estimates. This together with increase in current contributions and certain emergency economies, applicable to that year only, made it feasible to finance the budget of 1934-35 without any permanent setback to long-time development plans.

The budget adopted for the year 1935-36 called for an excess of expenditures over total current income from students, investments, and services of about $45,000. However, certain minor economies were effected during the year and income from investments improved. Moreover, income from students greatly exceeded estimates, due to the inauguration of the Cooperative Course in Mechanical Engineering in the middle of the year, and to an unexpected increase in the evening school. These favorable factors reduced the anticipated excess of expenditures from $45,000 to about $30,000. However, we had entered the year with a $20,000 excess of payables over receivables, so that the financing required about equalled the original estimated deficit of $45,000. Individual contributions to cover current operations during the year 1935-36 were over $20,000 compared with slightly more than $15,000 for the preceding year and with less than $10,000 for the year 1933-34.

The significant fact to be noted in connection with the three budget periods here reviewed is that income from students and services has been consistently greater than could have been forecast at the beginning of the period. On the other hand, income from individual contributions, in spite of the improvement above noted, has consistently fallen below estimates. Although we have been handicapped by depression psychology, our experience in regard to soliciting individual contributions to cover current needs confirms the experience of other educational institutions over a period of years, and leads to the conclusion that this form of financing should not be relied upon as a major source of income.

During the past year, attention has been focused upon developing new services and thereby sources of income to supplement student receipts, present income from investments, and reasonable expectations from individual contributions. It is clear that the soundest possible way of enlarging our sources of income would be through increased endowments. At the same time, it is probable that the best approach to efforts to increase endowment will be found through expanding our services and through effective interpretation of those services as they contribute to the needs of industry and of the community generally.

Of course, the largest and most important service rendered by any college of high standing is the constant flow of selected and developed human material which it makes available for the enrichment of the industrial and cultural life of its community. This type of service, however, is likely to be taken for granted, and it is not always easy to make it, unaided, a basis of support for privately controlled schools which have the greatest need of such support.

Research Foundation and Projects

Next to the function of turning out well educated young people, the most obvious service which a college, especially a college of engineering, can render to industry is in the field of engineering research. The founder of Armour Institute of Technology had a keen sense of the vital relationship between technical education and industrial progress, and he dedicated the Institute to certain ideals in respect to this relationship which have continued throughout the years. With the passage of time, scientific research has come to be more and more of the very essence not only of industrial progress but of industrial security. Scientific discovery in our generation made available through the medium of technology has created a new world and seems to be in the process of creating a still newer world. It is the firm purpose of those responsible for the policies of Armour Institute of Technology to maintain for it a worthy and important place in these creations.

It will be recalled that a proposal to establish a Research Foundation was presented to the Board of Trustees at its meeting on May 27, 1935. As set forth in the published report for the fiscal year 1934-35, the President, the Chairman of the Board, and members of the staff gave much attention to the subject during the summer and fall of 1935, and conferred with the representatives of various research laboratories, foundations, and schools of engineering.

In December, 1935, the Universal Oil Products Company, through the good offices of Mr. John J. Mitchell of the Board of Trustees, established a research fellowship attached to the Department of Chemical Engineering. This arrangement became effective on January 1, 1936, with Dr. Vasili Komarewsky as research fellow. Dr. Komarewsky received his doctorate from the Moscow State University in 1925. He was connected with the Kaiser Wilhelm Institute in Berlin as research chemist from 1926 to 1930, and was chief chemist of the State Institute for Peat, Moscow, also lecturer at the Moscow Academy

of Mines from 1927 to 1930. Since 1931, he had been research chemist for the Universal Oil Products Company, and lecturer at Northwestern University.

Active interest in the development of research has been manifested by members of the Board of Trustees. Mr. Stuyvesant Peabody offered to bring about the underwriting for one year of a considerable project for studying Illinois-Indiana coals, his thought being that if such a research project were set up and carried on effectively, the work would become continuous. Upon advice of counsel and in accord with sound policy, it seemed desirable, before undertaking so considerable a project, to set up a distinct Research Foundation. This action, as you know, was authorized at the special meeting of the Board on April 3, 1936. Copies of the certificate of incorporation and by-laws, and a list of the officers and directors are attached hereto. The Foundation will be occupied both with research for industry and with basic independent research.

Immediately after the Research Foundation was established, search for a director for the coal project was undertaken. Dr. Robert D. Snow was appointed to the position, and began work on July 1, 1936. Dr. Snow came to the Research Foundation from the research laboratories of Phillips Petroleum Company. He was formerly with the Engineering Experiment Station of the University of Illinois, and before that had served as research chemist for the Mid-Continent Petroleum Corporation and General Motors Research Laboratories.

Shortly after the Foundation was organized, another member of the Board of Trustees, General Thomas S. Hammond, President of the Whiting Corporation, arranged to have Dr. William A. Pearl, of the Department of Mechanical Engineering, undertake a temporary piece of intensive work in respect to mechanical stokers. When the original assignment was completed early in August, arrangement was made for extending it through the current school year. Plans are also in progress with the Whiting Corporation for undertaking a considerable research project in the field of chemical filtration. In order that this work may be handled to the best advantage, a distinguished new member has been added to the Department of Chemical Engineering in the person of Dr. O. A. Hougen, who will come to us from the University of Wisconsin in the second semester of the current year. Dr. Hougen was formerly coordinator of research in silk testing for the United States Testing Laboratories. He is best known for his research in the flow of heat and for a text on Industrial Chemical Calculations.

Another program for cooperation with a specific industry, formulated for presentation to the industry, is a proposal to develop the subject of Metallurgy, both in its instructional and research aspects. This was one of the subjects which was outlined under the heading, "Opportunity for Special Financing", in the published report for the year 1934-35. The initial response of members of the steel industry has been encouraging, and there is good prospect that a cooperative program may be developed within the next year.

The Chairman of the Board and members of the staff have been, for several months, occupied with a plan for cooperating with the public utilities. Although the plan is not confined to research, the establishment of the Research Foundation makes service to the public utility industry practicable on a much larger scale than would have been feasible before the Research Foundation was started. It is hoped that a program can be worked out through which a considerable part of the type of research which the local utilities have been placing elsewhere in this area can be undertaken by the Research Foundation at Armour.

A research project entitled, "The Development of Units of Work and Measurement Which Will Have Practical Application in Public Administration and Control of Municipal Refuse Collection", together with application for funds necessary to conduct this research, estimated at $10,000 per year for two years, was submitted to the Rockefeller Foundation on May 1, 1936. The prospectus was prepared by Professor Harold A. Vagtborg in cooperation with the Public Administration Clearing House and allied organizations, and has the endorsement of the American Society of Municipal Engineers and the International Association of Public Works Officials. The trustees of the Rockefeller Foundation are expected to act on the application at an early fall meeting.

Reference has been made in previous reports to the research and testing work carried on individually by members of the faculty. Such research has produced throughout the years an imposing array of scientific discoveries and inventions. To cite a few, Armour is reputed to be the first school to offer advanced courses in aerodynamics and airplane design. Many chemical processes had their origin in the Armour laboratories. Difficult problems in acoustics of buildings have been solved. One of the earliest radio messages ever transmitted originated on the Armour campus. Instruments and methods, in almost universal use, for measuring heat flow through building materials were invented at Armour. For almost a generation, Armour played a

leading role in advancing the engineering of power plants. The automotive laboratory has, for many years, done notable research in the field of internal combustion engines, performance of motor fuels, and other phases of automotive engineering. A member of the Institute staff assisted in the early development of the Mercury tractor and "trackless train" method of handling freight and commodities at the Union Stock Yards.

Laboratory activities in bacteriology and sanitary engineering include an experimental water treatment plant, which is a complete operating unit adapted for research. A study of the characteristics of wire rope as electrical conductors, financed by the Williamsport Wire Rope Company, has recently been completed. Publicity attending the establishment of the Research Foundation has resulted in conference with representatives of some half dozen important concerns which look toward setting up specific research projects at an early date.

As set forth in earlier reports, measures have been under way during the past three years to bring the research work of members of the faculty within the scope of general Institute policy. On September 1, 1936, all of this work in which Institute facilities are used was taken over by the Research Foundation.

Appointment of Director

From the time the proposal to establish a Research Foundation was presented to the Board of Trustees in May, 1935, it was recognized that one of the first needs was the selection of an able director. Inquiries to that end which were begun in the summer of 1935 were continued throughout the past academic year with the result that on August 24, 1936, the Board of the Research Foundation elected Dr. Thomas C. Poulter as Director of the Foundation, and Dr. Poulter assumed office on September 1, 1936.

Dr. Poulter was senior scientist and second in command of the Byrd Antarctic Expedition II, and is one of the leading scientists of the country in electrical, chemical, physical, and optical effects of extremely high pressure. He has also done notable work in organic chemistry, geophysics, seismology, terrestrial magnetism, and other fields. He has the enthusiastic sponsorship of eminent physicists and chemists of the country, and was highly endorsed by men responsible for research in several leading industrial corporations. Admiral Byrd notes that Dr. Poulter deserves the full credit for the scientific work of the Second Antarctic Expedition, and that he was largely responsible for the success of much of the promotional and organizing work.

Educational Cooperation with Industry

The most specific item other than research in advancing our program for cooperation with industry during the year 1935-36 was the establishment of the Cooperative Course in Mechanical Engineering. The initiative for this undertaking was taken by General Thomas S. Hammond of the Board of Trustees, and it was through his continued interest and help that the participation of industrial concerns was effected. As indicated in the report of the Dean, the course is well under way, and has every promise of being a permanent item in our educational program. Its effect should be not only to bring the Institute into closer contact with industry but it will give opportunity every year for some hundred select but impecunious young men to secure an engineering education. It will have the additional advantage, both for the young men and the industries in which they serve, of giving them, during the years covered by the course, their initial training in holding an industrial position.

The establishment of the undergraduate Cooperative Course in Mechanical Engineering led to the suggestion by a representative of a large electrical concern that there was a field in Chicago for a graduate Cooperative Course in Electrical Engineering. Discussion of this subject resulted in delegating Professor David Moreton of the Electrical Engineering Department to investigate a similar course carried on cooperatively by the General Electric Company and the Massachusetts Institute of Technology. The subject is now before the faculty Committee on Graduate Study, and there is considerable probability that such a course will be undertaken.

At the suggestion of Mr. Alfred L. Eustice of the Executive Committee, a project is under way for developing a special course of lectures for executives during the coming winter, in which particular stress will be laid on the subject of Maintenance Engineering. Present plans are for inaugurating such a course early in January, 1937.

In all of these projects, whether in the nature of research, special instruction, or services of other types, it is recognized that any service undertaken should be so budgeted as to carry an adequate loading and thus to help in financing the budget of the Institute.

Current Year's Program

The budget for the year 1936-37, which was passed by the Executive Committee on August 31, 1936, and is now submitted for your approval, was prepared in the light of the developments just outlined and of the necessity of keeping the instructional work of the Institute up to the high standards implicit in those developments. More particularly, it was necessary to provide in the budget for handling the Cooperative Course, for taking care of an expanding program of graduate work, and an enlarged evening school, as well as for increased registration in some of the regular undergraduate options. Requirements to meet these needs included additional space and equipment and new personnel.

As a result of depression and emergency conditions during the past few years, members of the faculty quite generally have been carrying excessive teaching loads. In preparing the budget for the current year, effort has been made to correct this situation and to release considerable faculty time and energy from routine teaching and to direct that energy into research and other activities that will make for constant raising of standards. In setting up the budget of the Research Foundation which, in a sense, is a complement of the Institute budget, an initial allocation of from $20,000 to $25,000 has been made for salaries, of which about one-half goes to regular members of the Institute faculty who are in a position to serve the Foundation. Reduction of teaching loads, provision for an expanding program of graduate work, and specific allocation of faculty time and energy to research, in addition to providing for normal growth, for the Cooperative Course, and for an expanded evening school, all represent significant enrichments of the Institute program which are mutually stimulating.

The budget which has been placed in your hands calls for expenditures for the current year of about $390,000 compared with slightly above $345,000 for the year 1935-36. Expenditures contemplated for the current year are made up of about $45,000 for building and equipment, $65,000 for administration, and somewhat more than $280,000 for instruction, instructional expense, retirements and scholarships. Present indications are that student receipts from fees of all kinds will amount to about $335,000, leaving about $55,000 to

be covered by income from investments, services, and contributions. The financing required during the year will be somewhat in excess of this amount, inasmuch as payables at the end of the year 1935-36 were still in excess of receivables. The figures just mentioned are for the Institute proper and do not cover the budget of the Research Foundation, which is necessarily flexible, but will probably total upwards of $75,000.

Business Office Personnel and Procedures

Mr. Wallace M. Flower, who was appointed Controller in the spring of 1935, withdrew in April of this year to become associated with William McCormick Blair in the investment banking business. Pending the appointment of his successor, the active handling of investments was divided between two committees of the Board of Trustees, of which Mr. Newton C. Farr and Mr. Paul H. Davis, respectively, are chairmen. Professor Harold Vagtborg of the Civil Engineering Department was made Superintendent of Buildings and Grounds.

Mr. E. O. Griffenhagen of the Board of Trustees has very generously made the services of his organization available for a careful study of internal business policies and procedures. This study is especially timely in relation to setting up the Research Foundation and articulating its accounts with those of the Institute. Mr. Griffenhagen has recommended the acquisition of certain new equipment and the installation of procedures directed toward simplifying operations and a more definite fixing of responsibilities. This report has been approved by the Executive Committee, and its findings are being installed under the supervision of Griffenhagen and Associates. Further recognition of Mr. Griffenhagen's contribution occurs later in this report.

Building Changes

Concurrently with the appointment of Professor Vagtborg as Superintendent of Buildings and Grounds, a committee of the Board, consisting of Messrs. Alschuler and Farr, was named to cooperate with the Superintendent in developing a program for conditioning space in the present Institute buildings to provide for the Cooperative Course, for the expansion of certain departments, and to meet indispensable needs of the Research Foundation. In pursuance of these plans, space has been provided for the offices of the Research Foundation and for

the several projects now under way. The chemical laboratory and the first floor of Chapin Hall have been remodeled in such a way as to provide more and better classrooms than have been available heretofore. The program worked out by the Committee, in cooperation with Professor Vagtborg, and approved by the Executive Committee, will make it possible to take care of the imperative needs of the Institute and the Foundation at minimum expense and without prejudice to long-time policy in respect to a future site and plant.

Question of a Permanent Site

Although the necessity and therefore the wisdom of making such changes in our present plant as are required for current business and our development program are beyond question, the need for a better plant suitably located is as urgent as ever. Until that need is met, we shall continue to operate under a serious handicap which it should be our purpose to remove at the earliest possible moment. Numerous conferences have taken place during the past year directed toward securing, at the same time, a plant adapted to our requirements and enough endowment to put all of our activities on a sound financial footing. From all appearances, there is distinct promise that these efforts will bear fruit at an early date, but we cannot, of course, assume a successful outcome until it occurs.

Special Needs

Reference should be made again to some of the opportunities for special financing which were outlined at length in the President's report for 1934-35, and which continue to be important items in our long-time program.

Approaches which have been made to representatives of the steel industry in reference to instruction and research in Metallurgy have already been noted. Similarly, business concerns, individuals, or associations interested in such subjects as aeronautics, air-conditioning, refrigeration, automotive engineering, sanitary engineering, and other special fields should have brought to their attention the opportunity to assist in the further development of instruction and research in these subjects. Members of the Board during the past year have helped greatly in exploring and developing possible sources of support. Their continued assistance in working out practical programs for augmenting

our resources is indispensable. In some cases, plans for securing new income involve sizable permanent endowments; in other cases, what is needed is a considerable outlay to meet a specific requirement; in many cases, much can be accomplished by relatively modest amounts. A case in point is soil mechanics, in which a small sum of money would equip a highly essential laboratory in this important new branch of Civil Engineering.

Other requirements to which constant attention should be given are endowments for professorships and for retiring stipends. The demands on the library present a serious problem, which might well be met by a sizable library endowment. Heavy enrollment and an expanding program of research make well rounded library service indispensable.

In the President's report last year, emphasis was placed upon the need for adequate scholarship funds for students of distinction, supplemented by revolving loan funds for students of more than ordinary promise. Privately supported schools of outstanding rank must maintain their tuition rates on a high level. The availability of scholarships and adequate loan funds makes it possible to do this without jeopardizing the opportunity of promising but impecunious students to secure an education in such a school. Repeating what was said last year, endowment for scholarships to cover the full cost of instruction should occupy an increasingly important place in our financial program.

Recognitions

Advisory Committee of Architects

An outstanding event of the past year has been the service rendered by the Advisory Committee of Architects, creation of which was noted in the President's Report for 1934-35. This committee consists of John A. Holabird, Chairman; Alfred S. Alschuler; C. Herrick Hammond, of Burnham Brothers and Hammond; Jerrold Loebl, of Loebl and Schlossman; and Alfred Shaw, of Graham, Anderson, Probst, and White. Three members of the committee are alumni, Mr. Alschuler who is also Vice Chairman of the Executive Committee, Mr. Hammond, and Mr. Loebl. The Committee has been of constant service to the department, and when it was found that the pressure of other work would bring about the withdrawal of the Director, the Committee instituted a world-wide inquiry for a suitable successor.

Pursuant to the recommendation of the Advisory Committee, Mr. Louis A. Skidmore of Skidmore and Owings has been appointed Direc-

tor and Professor of Senior Design, and Mr. Loebl will serve as Assistant Director. The Institute deems itself extremely fortunate in these appointments, as well as in the increasingly important service which the Advisory Committee of distinguished architects is rendering.

Professor Earl H. Reed, the retiring Director, and Assistant Professor Charles G. Beersman, who is relinquishing his work in Senior Design, take with them the sincere good wishes of the authorities of the Institute and of their many friends in the faculty, and in the architectural profession.

Individual Service by Trustees

As noted above, it was through the good offices of Mr. John J. Mitchell of the Board of Trustees that the research fellowship in the chemistry of oils was established at the Institute during the past year. This is only one of the numerous and untiring ways in which Mr. Mitchell has been of service.

Mr. Stuyvesant Peabody of the Board of Trustees has demonstrated his faith and has rendered an inestimable service by making available a research project of such large dimension that it gave the required impetus to bring about the creation of the Research Foundation. This service is destined to become historic.

General Thomas S. Hammond not only gave the inspiration for the Cooperative Course but his efforts in introducing it to other employers was a large factor in giving it a propitious start. General Hammond has also manifested his characteristic team-play in placing projects with the Research Foundation, and in giving the kind of cooperation needed for their success.

Mr. Edwin O. Griffenhagen, who is both an alumnus and a member of the Board, has likewise placed himself and his organization at the service of the Institute in a most generous way. Mention has already been made of his service in connection with business office policy, procedure, and personnel. Mr. Griffenhagen's contribution is exceedingly valuable and timely, and merits the cordial appreciation of the administration and the Board of Trustees.

The service rendered by Mr. Newton C. Farr and Mr. Paul H. Davis in connection with our properties and investments has also been noted; sincere appreciation is due Messrs. Davis and Farr for the help they have given.

Finally, our general counsel, Mr. Homer H. Cooper, has continued

throughout the past year to handle many important legal matters with the outstanding ability and thoroughness characteristic of all his work. His studies preparatory to drafting the certificate of incorporation and by-laws of the Research Foundation, and the clarity and comprehensiveness of those documents bear evidence of Mr. Cooper's exceptional qualities both as attorney and author. In drafting the certificate of incorporation and by-laws of the Research Foundation, Mr. Cooper counselled with Messrs. Hills, Parker, and Wiles of the Board of Trustees, especially in respect to matters of patent law.

At the spring meeting of the Board, announcement was made of a signal honor received by one of the younger members of the faculty, Dr. Rufus Oldenburger, who was asked to read a paper before the Quadrennial Meeting of the International Mathematical Congress at Oslo, Norway, in July of this year. The invitation was contingent upon attending the meeting in person. At the suggestion of the Chairman, the members of the Board made up a purse to cover the cost of Dr. Oldenburger's trip to Norway. Dr. Oldenburger reports that his contacts and experiences abroad were of the highest value, and he reiterates his deep appreciation to all of those who enabled him to accept this invitation by which he and the Institute were honored. The tangible evidence of response from members of the Board of Trustees to scholarly recognition given a member of the faculty is highly gratifying.

Although the above services merit special recognition, they do not detract from the appreciation felt by the administration for the help that has been given by the other members of the Board of Trustees, and for the interest and support that members have shown, both financially and morally. Not the least of the services rendered has been the individual counsel of trustees, of which the President has availed himself freely.

Commencement Speaker

Mr. Lawrence A. Downs of the Board of Trustees, President of the Illinois Central System, delivered an inspiring address at the Fortieth Annual Commencement held at Mandel Hall on June eleventh. The message which Mr. Downs gave to the 173 recipients of degrees contributed greatly toward the high level which the 1936 Commencement at Armour established for events of its kind.

Election of Charles S. Davis

One notable addition has been made to the Board of Trustees since the last annual meeting. Upon unanimous vote of the Board of Trustees at a special meeting held in April, 1936, Mr. Charles S. Davis, President of Borg-Warner & Company, was invited to become a trustee of the Institute and a member of the Board of Directors of the Foundation. Mr. Davis has since been elected and has accepted these positions. It is gratifying to have Mr. Davis join forces with us.

Board of Directors of Research Foundation

The members of the Board of Directors of the Research Foundation have taken up their work with full understanding of the responsibility involved in getting the Foundation successfully under way. The Board has so directed initial policies that serious mistakes have been avoided, and sound policies are being established. The work of the Board is worthy of the sincere appreciation which is felt by everyone who has a stake in the task to which the Foundation is dedicated.

Executive Committee

Particular mention should be made of the untiring service performed during the year by the Executive Committee, both collectively and individually. Meetings have been held almost weekly and many difficult and trying problems have been solved. Regular meetings of the Committee are held at the Union League Club at luncheon on Mondays. Members of the Board who may find it convenient to attend any of these meetings will always be welcome.

The diligence of a special committee on the budget, of which Mr. Alschuler is Chairman, is largely responsible for the improved showing this year in respect to individual contributions.

Faculty

It is a privilege to give public recognition to the devoted service rendered by the faculty during the past year. After carrying heavy burdens and maintaining scholarly poise and morale in the difficult conditions of the past few years, members of the faculty, individually and as a group, have shown a most gratifying and unselfish readiness to assume new responsibilities incident to advancing our development program as outlined above.

Retirement of Professor John E. Snow

After forty-two years of service, Professor John E. Snow of the Department of Electrical Engineering retired at the end of the academic year 1935-36. The long and loyal service which Professor Snow has rendered to the Institute since its earliest days deserves the warmest recognition on the part of the Board of Trustees, the administration, and his colleagues in the faculty.

The Executive Committee has voted to confer on Professor Snow the status of Professor Emeritus. This action and its confirmation by the Board of Trustees add a fitting chapter to a career of devoted service to Armour and to education.

Respectfully submitted,

WILLARD E. HOTCHKISS,
President.

REPORT OF THE DEAN

To the President:

The following report covers the activities of the school year ending August 31, 1936.

Faculty

Organization

The Faculty Council, consisting of all professors and associate professors, continued to serve as the legislative body of the faculty, meeting at monthly intervals. Numerous Committees of the Council have studied specific problems and have served as administrative units in developing plans for graduate study, handling fraternity affairs and administering scholarships and loan funds.

Appointments and Promotions

New appointments during the year include the following: Dr. Thomas C. Poulter, Director of the Research Foundation and Research Professor of Physics; Dr. Robert D. Snow, Director of the research project in Combustion and Professor of Chemical Engineering; Dr. Vasili Komarewsky, Research Chemist and Lecturer in Chemistry.

Mr. Louis Skidmore has been appointed Director of the Department of Architecture and Professor of Senior Design; Mr. Jerrold Loebl, Assistant Director; and Mr. Sterling Harper, Instructor in Architectural Construction.

The Department of Mechanical Engineering has been augmented by the appointment of Mr. Leonard J. Lease as Industrial Coordinator and Associate Professor of Mechanical Engineering; Dr. Carl G. Anderson as Instructor in Mechanical Engineering; Mr. William J. McLarney, Instructor in Mechanical Engineering; and Mr. Alfred W. Kube, Instructor in Foundry.

Dr. Jesse E. Hobson and Mr. Earle L. Kent have been appointed instructors in Electrical Engineering.

New instructors in the Department of Chemical Engineering include Dr. Ralph H. Manley, Dr. John A. Schaad, and Mr. Otto Zmeskal. Dr. Horace A. Giddings was appointed Assistant Professor of Mathematics, and Dr. G. Cuthbert Webber, Instructor in Mathe-

matics. Mr. Jarl T. Sorenson was appointed Instructor in Fire Protection Engineering. Miss Esther E. Chesire has been appointed Assistant Librarian, and Mr. Grant Stenger, Instructor in Physical Education.

Dr. Charles A. Tibbals, who for many years served as Professor of Analytical Chemistry, has been promoted to Assistant Dean. He also continues in charge of work in General and Analytical Chemistry. Mr. Harold A. Vagtborg and Mr. Sholto M. Spears have been promoted to Associate Professors of Civil Engineering. Mr. Walter H. Seegrist was promoted to Associate Professor of Machine Design. Dr. Rufus Oldenburger was promoted to Assistant Professor of Mathematics, and Mr. Arthur S. Hansen to Assistant Professor of Economics. Mr. James D. Potter, formerly Instructor in Mathematics, is now Instructor in the Department of Physics. Mr. Arthur W. Sear now devotes full time to the Department of Electrical Engineering, as Assistant Professor.

Mr. Herbert Ensz, who was granted a leave of absence for the second semester 1935-36 for advanced study in soil mechanics at Harvard University, resumes his duties in the Department of Civil Engineering as Associate Professor.

New appointments in the Evening Division include Mr. Everett C. Shuman, Instructor in Mechanics; Mr. Charles Leckrone, Mr. Harold P. Brady, and Mr. Wilfred Woodley, Instructors in Mathematics; Mr. Frank Thalle, Instructor in Heating and Ventilation; Mr. Arthur B. Bronwell, Instructor in Electrical Engineering; Mr. James A. Clear, Instructor in Machine Drawing; Mr. Daniel P. Van Etten, Instructor in Machine Shop; Mr. Elmer Gammeter, Instructor in Metallurgy; Mr. George H. Kern, Instructor in Welding; and Dr. Bernard Weinberg, Instructor in English.

Resignations

Mr. Earl H. Reed, for several years head of the Department of Architecture, resigned to devote full time to the practice of his profession, as did Mr. Charles G. Beersman and Mr. Edward Merrill of the same Department. Professor John E. Snow of the Department of Electrical Engineering retired as Professor Emeritus after forty-two years of service. Mr. Harvey O. Snediker resigned as Assistant Professor of Fire Protection Engineering. Other resignations were Dr. Frank T. Barr, Instructor in Chemical Engineering, Mr. William C. Krafft, Instructor in Physical Education, and Miss Ruth L. Verwey, Assistant Librarian.

Professional Activities

Society for the Promotion of Engineering Education. Many members of the faculty have participated in the activities of the Society for the Promotion of Engineering Education. Professor Joseph B. Finnegan this year completed a three year term as a member of the National Council and served as Chairman of the Committee on Industrial and Trade Associations. The Illinois-Indiana section of the Society, organized in 1935, held its second annual meeting in Chicago as guest of Armour Institute of Technology. Professor Finnegan served as President of this section. Papers were presented at the general meeting by Mr. Lawrence A. Downs, Trustee, and by the Dean. Papers and discussion were presented at section meetings by Professors Thompson, Richardson, Paul, Hendricks, Penn, and McCormack, and Mr. Goetz and Dr. Barr, of the Armour faculty. The annual meeting of the national society, held in June at Madison, Wisconsin, was attended by more than thirty members of the Armour faculty. Professor McCormack presented a paper on "Flow of Heat" before the Chemical Engineering Laboratory Division, and was selected as editor of this division for the coming year. Professor Seegrist and Mr. Hammett attended the pre-convention conferences on Engineering Drawing and presented discussions on teaching methods.

Western Society of Engineers. The Western Society of Engineers, serving as a general local society for all branches of the profession, engages the attention of many Armour faculty members. Professor Herbert Ensz delivered a paper before the Society entitled "Soil Mechanics Applied to Foundations and Other Engineering Problems" which was published in the Journal for May, 1936. The Dean served for the second year as Chairman of the Education Committee of the Society and was assisted by Professor Wells and Mr. Setterberg, also members of this committee. This Committee's work is largely responsible for the inauguration of the program of part time graduate courses for engineers in the Chicago area in the Fall of 1936. The Dean was also elected to the Executive Committee of the Bridge and Structural Section and serves on the Program Committee of the Society. Professor Finnegan serves on the Awards Committee.

Other Engineering Societies. Professor Freeman has been Chairman of the Student Activities Division of the Great Lakes District of the American Institute of Electrical Engineers. He is also Chairman of the Educational Committee of the Chicago Section and was a delegate

to the National Convention of the American Institute of Electrical Engineers at Pasadena, California. Professor Roesch is a member of the executive branch of the Chicago Section of the American Society of Mechanical Engineers and was largely responsible for the conferences of student members in the mid-western district held in Chicago last Spring. Dr. Anderson delivered a paper on "Determination of Residual Stresses in Thin Tubes by Means of Optical Measurements" which will be published in the near future. Facilities of the Institute have been used by the Chicago Section of the American Welding Society for monthly meetings throughout the year.

Professor McCormack has taken active part in the affairs of the American Institute of Chemical Engineers and presented a paper at the annual meeting at Wilmington, Delaware. Dr. Barr served as Secretary for the Chicago Section of the Society. One dinner meeting of this Section was held at the Institute where the entire program was devoted to presentation of chemical engineering research by Armour students.

Professor Libby served as Chairman of the Program Committee for the Atlanta Convention of the National Society of Practical Refrigerating Engineers. Professor Vagtborg was elected Secretary-Treasurer of the Chicago Section of the American Society of Municipal Engineers. Professor Ensz attended the International Conference on Soil Mechanics held at Cambridge, Massachusetts in June, and Professor Paul has been Chairman of the Committee of the American Society of Testing Materials to Develop Standard Specifications for Timber Piles. Professor Carpenter has been active in the Chicago Chapter of the American Institute of Mining and Metallurgical Engineers.

Science and Mathematics. As noted in the President's Report, Dr. Rufus Oldenburger represented the United States on the algebra program of the International Congress of Mathematicians held at Oslo, Norway in July. He also presented papers before the American Mathematical Society Section of the American Association for the Advancement of Science at St. Louis and at the annual spring meeting of the American Mathematical Society held in Chicago in April. Dr. Thompson served as President of the Chicago Section of the American Association of Physics Teachers, has been active in the Chicago Physics Club and is a member of the National Executive Council of the American Association of Physics Teachers. Professor Krathwohl has completed his term as President of the Men's Mathematics Club of Chicago, and supervised an exhibition of rare mathematical books from

the collection owned by Armour Institute of Technology. He also served as a Chairman of the Resolutions Committee of the Mathematical Association of America. This committee is inaugurating a movement to standardize mathematical education in the grade schools.

Dr. Van Atta attended the Kansas City meeting of the American Chemical Society and presented a paper on "Temperature Coefficient of the Dielectric Constant of Water"; and Dr. Komarewsky and Dr. Robert D. Snow attended the Pittsburgh meeting of the Society where Dr. Komarewsky presented a paper on "Hydropolymerisation." Professor McCormack and Dr. Barr also presented papers before the Louisville sectional meeting of this Society. Dr. Freud, as well as other members of the Chemical Engineering Department, has for many years been actively engaged in the affairs of the Chicago Section of the American Chemical Society. Professor Carpenter has lectured at the Adler Planetarium and constructed and installed a telescope at Ohio University.

General Electric Company Conference. Professor Moreton spent five weeks during the summer as guest of the General Electric Company, Schenectady, New York, attending a special conference of teachers of Electrical Engineering, arranged by Mr. M. M. Boring, Personnel Director of the Company.

Public Activities. Professor Penn serves as a member of the Board of Directors and the Dean as Secretary of the College Committee of the Adult Education Council of Chicago. Professor Finnegan assisted in the organization of the corps of Junior Fire Marshals sponsored by the Chicago Association of Commerce. He also addressed the Kiwanis Club in Roseland and a community club in Maywood at which he discussed practical methods of fire prevention. Professor Schommer has made a large number of talks during the year before various clubs and civic organizations. Professor Wells has served for several years as a member of The Chicago Association of Commerce Committee on Aeronautics, and Professor Thompson has been called on to give several talks on physical subjects before medical groups and other organizations.

Professor Hansen addressed the annual convention of the National Metal Trades Association on "Social Security Legislation," and led a discussion of pensions for Municipal Employees at the annual convention at Toronto, Ontario of the Municipal Finance Officers Association. He also discussed "Unemployment Insurance" at the Chicago convention of the American Management Association. Professor Dutton has

served as a director for the Society for the Advancement of Management, and has continued his work as associate editor of *Factory Management and Maintenance*. Mr. Goetz has served as treasurer of the Chicago chapter of the Society for the Advancement of Management; Professor Leonard J. Lease was elected President of the Illinois Industrial Education Association, and continues to serve as Treasurer of the Illinois Vocational Association.

The Dean was elected President of the Illinois Association of Deans and Advisers of College Men at the Springfield meeting, and attended the meeting of the national organization at Philadelphia. He was also elected a member of the Chicago Graphic Arts Council.

The President is a member of the National Association of Housing Officials and of the Education Committee of the Chicago Association of Commerce. He has also served as Referee for the National Railroad Adjustment Board.

Publications

Aside from papers read at meetings of professional societies and later published, as already noted, there have been numerous other publications by members of the faculty. Professor Vagtborg published an article on "Mixing Experiments—Armour Institute of Technology" in the *Engineering News-Record* for May 28, 1936, which was later reprinted in the *Surveyor* of London, England. He also published an article entitled "Novel Hydro-electric Control on Valves in New Treatment Plant" in *Water Works Engineering*, November 27, 1935, and in the *Engineering News-Record* of September 3rd, "Hydraulic Valves Controlled by Motor Driven Pumps."

Professors Swineford and Winston are authors of a new text on "Design of Machine Elements," while Professor Bibb and Professor Spencer of the Department of Mathematics published a new text entitled "Fundamentals of Algebra for College Students." Professor Roesch has published a second edition of "Diesel Engineering Manual," and Mr. Olson of the English Department is author of a new book entitled "Thing of Sorrow."

Dr. Oldenburger published a memoir of three chapters in the Transactions of the American Mathematical Society, May, 1936, entitled "Non-singular multilinear forms," "Factorization of p-way matrices into a product of 2-way matrices one of which is singular," and "Factorization of p-way matrices in 3-way matrices." Reports on

papers by Dr. Oldenburger entitled "Characteristic roots of direct products of n-way matrices," "Ranks of 4-way matrices," "Arithmetic invariants of binary cubic and binary trilinear forms," and "Rational equivalance of a form to a sum of p-h powers" appeared in the January, March and May issues of the Bulletin of the American Mathematical Society.

Mr. Goetz of the Social Science Department published an article in *Factory Management and Maintenance,* entitled "Production Control in a Small Intermittent Manufacturing Plant." The 1935-36 issues of *The Armour Engineer and Alumnus* carried articles by Professors Carpenter, Schommer, Krathwohl, Pearl, Peebles, Mr. Setterberg, the Dean and the President.

Reduction in Teaching Load

The Report of the Dean for 1934-35 pointed out the necessity for reducing faculty teaching loads. Substantial progress in bringing this about has been made in the adoption of the budget for 1936-37. Class hours for all members of the faculty have now been limited to a reasonable maximum including assignments in both day and evening classes. This has been accomplished without reduction in faculty salaries by fixing a single compensation to include the entire teaching schedule instead of providing extra compensation for evening class instruction. The average reduction in teaching load throughout the entire staff is approximately 12 per cent. This program necessitated a material increase in instructional expenses, but it is an important forward step.

Enrollment

There was a marked increase in enrollment during the year due to the introduction of the cooperative course and to a large increase in the Evening Division.

Day Students. 922 individual students were enrolled in the day classes. Enrollment in the first semester 1935-36 totaled 788 while the second semester enrollment was 850 including 82 students in the cooperative course.

For the Fall of 1936 the Freshman class has increased 35 per cent, and the total enrollment is 906 students of whom 74 are in the cooperative course. No material changes have taken place in the distribution of students among the various departments. Mechanical and Chemical Engineering continue to be the popular fields of specialization

with both of these departments accommodating a record number of students. Enrollments in Civil Engineering and Architecture continue somewhat below normal. The present total enrollment is an all time high for the Institute but will undoubtedly be exceeded in February, 1937 with the admission of another group of cooperative students.

Evening Division. Enrollment in the Evening Division for the first semester of 1935-36 was 822 as compared to 638 in the previous year. Advance registrations for the first semester 1936-37 promise an enrollment of over 1,400 students, which is 12 per cent greater than any previous enrollment in the history of the school. This increase is due to improved business conditions and to the larger number of courses now available in evening classes.

Summer School. There was an attendance of 226 students in the summer session of 1936 as compared to 212 in 1935.

Total Enrollment. The Institute served a total of 2,030 individual students during the year. This is an increase of 19 per cent over 1934-35.

Curriculum

Graduate Courses

The Committee on Graduate Courses, consisting of Professors Freud (Chairman), Freeman and Peebles, has worked diligently throughout the year to develop and improve the program of graduate study. One of the Committees' significant achievements has been the development of a comprehensive program of advanced study leading to the Master's Degree in the Evening Division. Five classes were offered in the second semester 1935-36 and attracted forty-five graduate students. Nine courses are being given in the Fall of 1936 and more than 130 students have already enrolled.

The Western Society of Engineers cooperated in building up interest in part-time graduate work among engineering graduates employed in Chicago, and served as the medium through which circulars were sent to 9,000 graduates of engineering schools.

Cooperative Course in Mechanical Engineering

A new five year cooperative course in Mechanical Engineering was added to the curriculum in February, 1936. This plan, which permits students to spend alternate eight week periods employed by industry and attending classes, is designed primarily to make it possible for

well qualified high school graduates of limited means to obtain a first class engineering education. It does not in any way replace the regular four year course.

Eighty-two students working in twenty-nine cooperating industries were in the first group to enroll in this program. These young men were selected from more than two hundred applicants. Students are now being selected by examination for a similar group to enter the course in February, 1937.

As previously noted, Mr. Leonard J. Lease joined the staff of the Institute in January, 1936 as Industrial Coordinator. Much of the preliminary work in organizing the program and selecting students was carried out by Professor Joseph B. Finnegan.

The following companies are cooperating with Armour Institute of Technology by providing employment for one or more pairs of students: Acme Steel Co.; All Steel Equipment Co., Inc., Aurora; W. D. Allen Mfg. Co.; American Can Co.; American Forge Co.; American Manganese Steel Co., Chicago Heights; American Steel Foundries, Indiana Harbor; Belden Mfg. Co.; Buda Co., Harvey; Chicago Screw Co.; Container Corp.; Danly Machine Specialties, Inc.; Delta Star Electric Co.; Foote Bros. Gear & Machine Corp.; General Electric X-Ray Corp.; Goodman Mfg. Co.; Great Lakes Forge Co.; Illinois Tool Works; Inland Steel Co., East Chicago, Ind.; W. A. Jones Foundry & Machine Co.; Link Belt Co.; Lyon Metal Products, Inc., Aurora; Miehle Printing Press & Mfg. Co.; Pyle-National Co.; Republic Steel Corp.; Stewart Die-Casting Co.; Union Special Machine Co.; Whiting Corp., Harvey; and Western Electric Co. Several additional industries have already indicated a willingness to participate in the program in February, 1937.

New Courses

New courses in engineering shop were organized during the year by Professor William A. Pearl. This work is now required in the Junior and Senior year for all students in Mechanical and Electrical Engineering, and was elected by many students from other departments. Although faced with the task of rehabilitating shops which had been idle for two years and developing a new and up to date program of instruction, Dr. Pearl has succeeded in organizing excellent courses in machine production, welding and heat treatment. The foundry will be reconditioned during the coming year.

The Department of Social Science added an elective seminar in business problems and elective courses were added in the Department of English.

Several new graduate courses have been developed in Mechanical, Electrical, Civil and Chemical Engineering and in Mathematics, Physics, Mechanics and Metallurgy, in connection with the Evening Division program.

Additional electives in Plant Design and in Catalysis have been offered to seniors in Chemical Engineering.

Evening Division Courses

The Report of the Dean for 1935 outlined a revised program of courses to be offered in the Evening Division, which would permit students to complete all of the first two years of the regular curriculum in four years' work in evening classes. The excellent response to this offering has effectively demonstrated its utility. As a matter of fact, the demand for advanced college credit courses has become apparent much sooner than anticipated and already nearly all courses in the Freshman and Sophomore year are attracting a satisfactory enrollment. A few Junior courses are now being offered and it seems quite likely that there will be an increasing demand for this work.

Student Personnel Program

The Report of the Dean for the year ending August 31, 1935 called attention to the need for a better integrated program of student personnel work. Steps have been taken during the past year to create such a procedure. In the Spring of 1936 all Freshman students were given a comprehensive series of tests consisting of a psychological examination, reading tests and study habits inventory. Based on the results of these tests, classes in study habits and remedial reading were formed by Mrs. Anne C. Orcutt of the University of Chicago, and after several weeks of intensive work, additional tests were given students in these classes and to a control group, to attempt to evaluate the effectiveness of this procedure.

During the summer Professor Krathwohl prepared a standard program of tests to be administered to all students entering the Institute. These tests, to be given immediately after registration, consist of a psychological examination, a mathematics examination, two reading and vocabulary tests and a general science examination. Results will

serve as a basis for a comparison of the abilities of Armour Freshmen with those at other institutions, as an aid in predicting probable success in college and will assist the student advisers in handling individual student problems.

Preliminary plans have been made to develop during the coming year a complete student personnel program under the direction of the Assistant Dean, making use of faculty counselors and an adequate system of records.

Scholarships, Loan Funds and Student Aid

Fifteen one year scholarships were awarded to Freshmen as a result of competitive examinations given in January and May. Approximately 200 applicants competed in these examinations and all were given personal interviews by members of the Scholarship Committee. One Civic Assembly Scholarship was awarded in connection with Chicago Youth Week and ten Freshmen were awarded four year scholarships in Fire Protection Engineering by the Western Actuarial Bureau.

An allotment of funds was received from the Estate of La Verne Noyes to provide scholarships for descendants of World War Veterans.

Seven endowed scholarships were awarded to Seniors. Other scholarships of this type, available to students in the Sophomore and Junior year are very much needed.

Loan funds proved adequate to meet the demands from Junior and Senior students but additional funds which could be loaned to Sophomores would be extremely helpful.

The National Youth Administration provided part time employment for nearly one hundred needy students throughout the year and proved especially valuable in enabling many of these young men to remain in school.

About forty students were given part time employment by the Institute as student assistants. In addition, several students worked for the school during the summer in connection with the construction program and on routine maintenance.

Student Activities

Student Recognition

Howard P. Milleville, 1936 graduate in Chemical Engineering, was awarded a Tau Beta Pi fellowship for graduate study at any institution of his choice, in competition with students from some sixty-five engineering colleges. Mr. Milleville is the second Armour student to receive this honor.

Peter Morrison, a Junior in Electrical Engineering, was awarded a $500.00 scholarship by the *Chicago Tribune* in a competition open to children of *Tribune* employees. Gordon Zwissler, 1936 graduate in Civil Engineering, was awarded a Junior membership in the American Society of Civil Engineers and Earl W. Engstrom, John H. Johnsen and Roy S. Kercher were awarded Junior memberships in the American Society for Metals.

John H. Johnsen, Senior in Chemical Engineering, won second prize in the National Student Problem Competition of the American Institute of Chemical Engineers and John Kahles of the same department was awarded a graduate fellowship at the University of Cincinnati.

Drawings prepared by two Armour students, Percy Cump and John A. Bobhill were awarded first prizes in the national drawing competition sponsored by the Engineering Drawing Division of the Society for Promotion of Engineering Education.

Albert Ramp, Junior student in Architecture, was selected by the Chicago chapter to attend the national convention of the American Institute of Architects.

Fraternities

One local and seven national social fraternities maintain chapters at Armour Institute of Technology. The faculty Committee on Fraternities consisting of Professor Spears, Chairman, Mr. Harris and Mr. Fulghum has been cooperating with these groups to improve business practices and to assist the chapter officers and the Interfraternity Council to increase their general effectiveness. The Committee has secured regular financial statements from each chapter and the Institute has insisted that members' accounts be paid. Present indications point to a very much improved situation among Armour fraternity chapters.

Musical Organizations and Dramatics

The orchestra and glee club under the direction of O. Gordon Erickson, completed a successful year. Innovations included an excellent concert at the Goodman Memorial Theatre and a trip to Milwaukee.

Mr. Fulghum served as faculty sponsor for an active group of students engaged in dramatics. One of their productions reached the finals in the City-Wide contest for amateur players sponsored by the National Youth Administration.

Graduate Placement

Concern has often been expressed in recent years for young men graduating from college who were unable to find satisfactory employment. Although this may have been a problem in 1933 it certainly has not been the case in 1936. The demand for technical men during the past year has been excellent and there are practically no graduates of the Institute, either from the class of 1936 or in previous years who are unemployed.

Starting salaries offered in 1936 were from five to ten per cent higher than in 1935 with the average range from $100 to $130 per month. The Institute has been visited by many representatives of industry and the Placement Office has been largely instrumental in securing employment for a majority of the recent graduates.

Many calls were received which could not be filled because of a shortage of men of proper experience.

Publicity

Systematic efforts have been continued to bring the Institute to the attention of prospective students and the general public throughout the Chicago area. The Publicity Committee with Professor Paul as Chairman has arranged for many visits to high schools and assisted in the preparation of a new pictorial booklet showing the work of the Institute.

A special booklet describing the course in Fire Protection Engineering was prepared by Professor Finnegan and given wide distribution.

Howard P. Milleville and Albert Schreiber, student publicity officers, worked faithfully to keep the Press informed of Institute activities.

The new *Armour Engineer and Alumnus* in its first year of publication set a high standard for magazines of this type. Financed and published jointly by the alumni, student body and the school, four thirty-two page issues were distributed to all alumni and students as well as to the Trustees and a selected group of business leaders. The quality of the magazine is evidenced by the fact that it placed second in the national competition for engineering college publications. Great credit for the success of this enterprise is due to Professor Hendricks who was in charge of editorial work, and to Professor Moreton whose business management made the magazine possible.

Equipment

Aside from normal replacements, major additions to equipment have been made in several departments. The work of the Research Foundation required the establishment of two new laboratories and additions were made to the general chemistry and organic chemistry laboratories.

New electric and gas welding equipment was added in the engineering shops and several items were added to the automotive laboratory. The entire first floor of Chapin Hall was reconstructed, providing several new class rooms and offices, and Science Hall was completely refitted with new chairs and an adjacent room for the preparation of lecture demonstrations.

Some improvements were made in the Water Filtration Laboratory and facilities were improved at the Civil Engineering Summer Camp at Trout Lake, Wisconsin.

Summary and Recommendations

Substantial progress has been made during the past year in improving standards of instruction, increasing the educational service which Armour Institute of Technology offers to the Chicago area, and in increased professional and civic activity on the part of members of the faculty and staff. Necessary additions and replacements in the faculty have without exception, materially strengthened the caliber of our teaching personnel.

The successful beginning of the cooperative course in Mechanical Engineering, the inauguration of graduate courses in the Evening Division, the increased emphasis on research made possible by the establishment of the Research Foundation, and a significant reduction in faculty teaching loads, all represent definite milestones along the road of educational accomplishment.

During the coming year several problems merit further consideration:

1. *Faculty*—The adjustments of salaries and teaching loads this year greatly improves the position of the faculty in those respects, compared to the rank and file of mid-western educational institutions. However, further provision for salary increases and reductions in teaching loads should be made.

2. *Curriculum*—The Report for 1935 pointed out the need for the establishment of an option in Aeronautical Engineering and in Metallurgical Engineering. This need still exists. Increased industrial activity in both of these fields is being reflected in increased demands for instruction and research. Consideration should also be given to the further development of courses in Industrial Engineering.

3. *Evening Division*—With the enrollment of evening students promising to set an all time high record during the coming year, serious consideration should be given to the establishment of a better administrative organization for handling this activity. In view of the many additions made to the Evening Division program during the past two years, it seems logical to expect a steady increase in enrollment in coming years, providing general business conditions are maintained at anything approaching normal. The Evening Division is now at a point where it merits the services of a full time Director.

4. *Physical Facilities*—Further improvements in physical facilities should be carried out as rapidly as possible. The space allotted the Library is inadequate to provide for the rapidly growing book stacks, and still leave space enough for the reading room. The Electrical Engineering department is in need of additional space and equipment, particularly for research and graduate work. It will be necessary to continue improvements and additions to the Chemistry and Chemical Engineering laboratories in order to provide properly for the large enrollment in this department. The Experimental Engineering laboratories and

Automotive laboratories are too small to carry adequately the load due to increased enrollment in Mechanical Engineering. Student comfort and recreational facilities should be augmented through the establishment of a student lounge in addition to the cafeteria which now partially serves that purpose.

Respectfully submitted,

HENRY T. HEALD,
Dean.

Report of the Director of Physical Education

To the President:

Some of the most important and perplexing problems of education today relate to the intercollegiate and secondary school athletics. Educators and taxpayers who are quite rational on other subjects frequently become hysterical on the subject of athletics.

The desire of boys to take part in athletic events is increasing by leaps and bounds. Last year 675,000 participated in football alone. Newspapers are devoting about four times the space to college and high school athletics that they did twenty years ago. This publicity means that millions of people are now actively interested in the subject.

The cost of upkeep for playing fields, stadia, and equipment is so great that many professors who think of athletics exclusively as an extra-curricular activity are startled by it. There is no common agreement as to the function of education, much less as to the function of school athletics. Here at Armour the policy has always been, as far as possible, to see that all students engage in athletic sports. This policy is pursued not only for the immediate results but because of the benefits that will come to students in later life. The program of physical education includes intercollegiate athletics, intramural sports, and gymnastics. Our slogan is "Athletics for all".

All students undergo a medical examination upon entering the Institute and receive instruction in personal hygiene and first aid to the injured from Dr. John F. McNamara, the medical adviser and examining physician. Freshmen and sophomores are required to take physical training for two hours per week. Contestants for the various athletic teams must submit to physical examination before entering any course of training. Athletic competitions comprise basketball, baseball, track, boxing and wrestling, golf, tennis, swimming, fencing, and shooting.

During the past year the name of the Armour Tech Athletic Association was changed to Armour Tech Student Association, in recognition of the fact that its jurisdiction extends not only over athletics but over musical clubs, publications, and other activities. The Association was formed in 1922 to organize and systematize all interclass relations, to promote interfraternity contests, and to stimulate interest in intercollegiate and intramural athletics. Its membership is limited to the students, alumni, and faculty of Armour Institute of Technology. Management of the Association is vested in a Board of Con-

trol, which is composed of student and faculty members. Intercollegiate athletics are under the direction of the Board of Athletic Control. Armour Institute of Technology is a member of the Northern Intercollegiate Conference, and contests in the several sports are scheduled regularly. Members of the teams are voted an athletic award each season by the Board of Athletic Control.

In order to carry out our program, space, buildings, and equipment are required. What Armour lacks, it borrows or rents from others. Baseball and outdoor track athletics are conducted on our own Ogden Field. Tennis likewise is played on our own courts, and boxing and wrestling are carried on in our small gymnasium. For other activities, it is necessary to utilize facilities elsewhere. Our indoor track teams use the Field House at the University of Chicago. For basketball, due to the lack of an adequate playing floor at Armour, the Wentworth Armory is used. Golf is played on the various courses about the city on the payment of greens fees. Swimming is carried on at the University of Chicago.

The Armour Tech Relay Games, which attract the attention of colleges and universities from all over the United States, are also held each spring at the University of Chicago Field House. Last year thirty-six colleges and universities participated, and much newspaper publicity throughout the country was given to this event.

Intramural sports are participated in by practically the whole student body. Fraternities, departments, and individual classes have teams in indoor and outdoor baseball, basketball, and track, and carry on intramural contests. The number of students who take part in these competitions is rapidly increasing, with the result that we are becoming more and more cramped for space.

The only change in the coaching force during the year has been the resignation of Mr. William C. Krafft as basketball coach and as instructor in gymnasium. Mr. Grant N. Stenger of Wheaton has taken Mr. Krafft's place in these activities.

Athletics and other student activities are conducted at Armour in such a way that they do not interfere with the scholastic work of students. As long as the present honest and wholesome relations with other colleges against which we compete continues, neither the size of our intercollegiate program nor the publicity given to it need be a cause for concern.

Respectfully submitted,

JOHN J. SCHOMMER,
Director of Physical Education.

RESEARCH FOUNDATION
OF
ARMOUR INSTITUTE OF TECHNOLOGY

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Paul H. Davis
Alfred L. Eustice
Robert B. Harper
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Willard E. Hotchkiss

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Charles W. Hills, Jr. ..... *Vice President*
Robert B. Harper ..... *Treasurer*
C. Paul Parker ..... *Secretary*
Joseph B. Finnegan ..... *Assistant Secretary*

Counsel

Homer H. Cooper — C. Paul Parker

Research Foundation of Armour Institute of Technology

The body of the President's report contains an outline of the events leading up to the establishment of the Foundation.

At a special meeting of the Board of Trustees of Armour Institute of Technology held April 3, 1936, a report from the Executive Finance Committee recommending the creation of a research foundation was adopted, and officers of the Institute thereupon took the necessary steps to bring about its incorporation. The certificate of incorporation is as follows:

"1. The name of such corporation is Research Foundation of Armour Institute of Technology.

"2. The object for which it is formed is:

"The business and object of the corporation shall be to promote, encourage, maintain and aid scientific investigation and research in affiliation with Armour Institute of Technology by the faculty, staff, alumni, with students thereof, and others associated therewith, and to provide or assist in providing the equipment, machinery and means by which their scientific studies, discoveries, inventions, and processes may be developed, applied and protected, and the public and commercial uses thereof determined and safeguarded, and by which such utilization or disposition may be made of such discoveries, inventions and processes as may tend to stimulate and promote and provide ways and means for further scientific investigation and research; and that in furtherance of said general purposes, the corporation shall have power and authority:

"(1) To experiment upon, test, promote, and develop the public, scientific and commercial value of inventions, discoveries and processes;

"(2) To prosecute or aid in the prosecution of applications for patents and to acquire patents, both foreign and domestic;

"(3) To receive donations, gifts, bequests, assignments or transfers of inventions, applications for patents, or patents, both foreign and domestic, and of rights, licenses and interests in inventions, discoveries, processes and patents, and of money or other property, and to accept the same subject to such conditions or trusts as may be attached thereto or imposed thereon with

respect to the payment of royalties, application of income or profits or otherwise, and to obligate itself to perform and execute and to perform and execute any and all such conditions or trusts;

"(4) To enter into contracts or trust agreements with inventors or applicants for or owners of patents, or of patent rights, licenses or interests, both domestic and foreign, for the rendering of aid in the obtaining, perfecting or maintaining of patents, both foreign and domestic, and the protection thereof, and for the testing, development, improvement, use and disposition of patented articles, devices and processes and for the disposition of the patent rights, licenses and interests of the inventor, upon such terms and conditions, and with such provisions as to application and use of earnings and proceeds as may be agreed upon;

"(5) To acquire and to sell and dispose of inventions, applications for patents, or patents, both foreign and domestic, and interest therein, and patent rights, licenses and privileges, including territorial rights, and to grant licenses to others to manufacture, use and sell, either or any, and to receive, collect and enforce collection of royalties, or other consideration, for patents or patent rights or interests or devices, articles or processes, of which disposition may be made or contracted for:

"(6) To prosecute infringements or invasion of any patent or patent rights in which the corporation may be interested, and to defend against infringement, and to protect any such patent or patent right;

"(7) To exercise any and all powers (including the borrowing of money and securing of the same, the holding, administration and disposition of property, the making of conveyances, assignments and contracts, and the incurring of obligations) which may be conferred by law or which may be necessary, incidental or convenient to the purposes above mentioned:

"Provided, however, that no dividends or pecuniary profits of any kind shall ever be declared or paid to the members of the corporation, and that all moneys or property received or held by the corporation shall be used, in such manner as the Board of Directors may decide, for the business and object of the corporation as first hereinabove set forth.

"3. The management of the aforesaid corporation shall be vested in a board of seven (7) directors.

"4. The following persons are hereby selected as the directors to control and manage said corporation for the first year of its corporate existence, viz.:

Name	*No.*	*Street*	*City*	*State*
James D. Cunningham	122	Melrose Ave.	Kenilworth,	Illinois
Williard E. Hotchkiss	Belmont	Hotel	Chicago,	Illinois
Paul H. Davis	256	Woodstock Ave.	Kenilworth,	Illinois
Homer H. Cooper	807	Milburn St.	Evanston,	Illinois
Charles W. Hills, Jr.	279	Moraine Rd.	Highland Park,	Illinois
Alfred L. Eustice	1138	Sheridan Rd.	Evanston,	Illinois
Robert B. Harper	5000	East End Ave.	Chicago,	Illinois

"5. The location of the business office of the corporation is in the City of Chicago, County of Cook, State of Illinois, and the post office address is at No. 3300 Federal Street, Chicago, Illinois."

On April 10, 1936, the original Board of Directors of the Research Foundation met and adopted the following by-laws:

By-Laws
of
Research Foundation
of
Armour Institute of Technology

Article I

Name

The name of this corporation shall be Research Foundation of Armour Institute of Technology.

Article II

Objects

The objects for which this corporation is formed are as stated in the Certificate of Incorporation.

Article III

Members

Section 1. The members of the corporation shall be divided into two classes, viz.: *Active Members* and *Sustaining Members.*

Section 2. *Active Members:* Any person who is a member of the Board of Trustees of Armour Institute of Technology, or who is a member of the faculty of Armour Institute of Technology, or who is a student or an alumnus of Armour Institute of Technology and whose name has been certified to the Board of Directors by the President of Armour Institute of Technology as, in his opinion, eligible for active membership, may be elected an Active Member of this corporation by its Board of Directors. The number of Active Members shall not exceed fifty at any one time.

Section 3. *Sustaining Members:* Any person may be elected a Sustaining Member by its Board of Directors. The number of Sustaining Members shall be fixed from time to time by the Board of Directors.

Section 4. A person who has been elected to Active Membership shall continue to hold his membership so long as he continues to possess the qualifications which made him eligible for election to Active Membership, or until such time as the Board of Directors, by majority vote, may determine to terminate his membership.

Section 5. A person who has been elected to Sustaining Membership shall continue to hold his membership so long as he complies with the conditions and requirements enacted by the Board of Directors for Sustaining Membership, or until such time as the Board of Directors, by majority vote, may determine to terminate his membership.

Article IV

Board of Directors

Section 1. The management and control of the affairs and funds of the corporation shall be vested in its Board of Directors, consisting of the number specified in the Articles of Incorporation, including amendments, if any.

Section 2. The persons named in the Certificate of Incorporation issued by the Secretary of State of Illinois shall constitute the members of the first Board of Directors and they shall all serve until the next ensuing annual meeting of the Active Members. At such first ensuing annual meeting of the Active Members, they, either by lot or in such other manner as they may determine, shall elect from their number two of the total number of directors to serve for one year thereafter, two to serve for two years thereafter, and three to serve for three years thereafter. As the term of the members of each such class expires, their successors shall be elected by the Active Members to serve for three years thereafter.

Section 3. Vacancies in the Board of Directors may be filled by election thereto at any regular or special meeting of the Board of Directors.

Section 4. In addition to the powers conferred by statutes and by these by-laws, the Board of Directors shall have the right to delegate to officers or to committees powers not otherwise forbidden by law and these by-laws to be delegated.

Section 5. Any member of the Board of Directors may be removed at any regular or special meeting of the Active Members by the affirmative votes of not less than two-thirds of the Active Members.

Section 6. No person shall be a director unless he is an Active Member of the corporation. Any member of the Board of Directors who ceases to be an Active Member of the corporation shall cease to be a member of the Board of Directors.

Article V

Officers

Section 1. The officers of the corporation shall include a President, a Vice-President, a Treasurer and a Secretary, and such other officers as the Board of Directors from time to time may create by resolution.

Section 2. At its first meeting the Board of Directors shall elect persons to the respective offices above mentioned and to such other office or offices as the Board of Directors may then create, all of whom shall serve until the next ensuing annual meeting of the Board of Directors. Thereafter, persons elected as officers of the corporation shall serve as officers for one year and until their respective successors are elected and qualified.

Section 3. The Board of Directors shall prescribe the duties of the respective officers and may provide that the same person can hold more than one office at the same time.

Section 4. In event of a vacancy in any office the Board of Directors may elect successor or successors to serve the unexpired term.

Section 5. Any person elected to any office may be removed therefrom at any regular or special meeting of the Board of Directors by the affirmative votes of not less than five members of the Board of Directors.

Section 6. No person shall be eligible to hold office in the corporation unless he is and continues to be an Active Member, but active members who are not members of the Board of Directors may be elected to any office or offices of the corporation.

Article VI

The President

The President shall be the executive of the corporation, exercising such supervision as will promote its educational, scientific and financial efficiency. He shall preside at all meetings of the Board of Directors and of the members. He shall be responsible for carrying out all measures enacted by the Board of Directors concerning the administration of the Foundation's affairs. He shall appoint with the approval and consent of the Board of Directors, members of the staff, agents, servants, employees and other representatives. He shall make an annual report to the Board of Directors concerning the work and needs of the Foundation.

Article VII

The Vice-President

In the absence of the President, or in any case wherein the President is unable to act, the Vice-President shall perform the duties of the President.

Article VIII

The Treasurer

The Treasurer shall be the financial officer of the corporation and shall perform the usual and customary duties of a Treasurer. He shall make an annual report of the financial condition of the corporation.

Article IX

The Secretary

The Secretary shall attend all meetings of the members and all meetings of the Board of Directors, keeping a true and complete record of the proceedings thereat. He shall have the custody of the corporate seal and of the corporate records and shall be responsible for their safe-keeping. He shall perform the usual and customary duties of a Secretary of the corporation.

Article X

Other Officers

The Board of Directors may from time to time authorize the President to appoint such assistant or assistants as may be deemed necessary or helpful in conducting the affairs of the Foundation. If such authorization of the Board of Directors so provides, such assistant or assistants may be made corporate officers, to hold office for such times and to perform such duties as the Board of Directors may direct.

Article XI.

Committees

Section 1. The Board of Directors may create such standing and special committees as the Board from time to time deems proper, and shall prescribe the numbers and qualifications of members of such committees, the tenure of office and the duties thereof. Members of standing committees may be chosen from the membership of the Board of Directors or from the list of Active Members, or from both. Members of special committees may be chosen from any class of membership and may include non-members of the corporation.

Section 2. The President shall appoint the members of all committees.

Article XII

Meetings

Section 1. The annual meeting of the Active Members shall be held on the first Monday in April of each year unless said Monday shall be a legal holiday, in which event said meeting shall be held on the ensuing day.

Section 2. The annual meeting of the Board of Directors shall be held immediately following the annual meeting of the Active Members.

Section 3. Other meetings of the Board of Directors shall be held at such times and places as the Board of Directors shall determine.

Section 4. Other meetings of the Active Members may be held at any time at the direction of the President or upon the application of any three members of the Board of Directors, or upon the application of any ten Active Members.

Section 5. Notices of the holding of annual meetings of the Active Members shall be sent to Active Members by mail at least ten days prior to the holding thereof. Notices of special meetings of the Active Members shall be sent to Active Members at least forty-eight hours prior to the holding thereof, either by mail or by telegram.

Section 6. Notices of the annual meeting of the Board of Directors shall be sent to members of the Board of Directors by mail or telegram at least five days prior thereto.

Section 7. Notices of special meetings of the Board of Directors shall be sent to members of the Board of Directors at least forty-eight hours prior to the holding thereof, either by mail or by telegram.

Section 8. All notices for meetings shall specify the hour and place of the holding thereof.

Section 9. Fifteen Active Members shall constitute a quorum for the transaction of business properly coming before Active Members of the corporation, but less than a quorum may adjourn any meeting from time to time.

Section 10. Four members of the Board of Directors shall constitute a quorum for the transaction of business properly coming before the Board of Directors, but less than a quorum may adjourn any meeting from time to time.

Section 11. Each Active Member shall be entitled to one vote at meetings of the Active Members of the corporation. Active Members may be permitted by appropriate action of the Board of Directors to participate by proxy in meetings of the Active Members.

Section 12. Sustaining Members shall not be entitled to vote at any meeting but, by invitation of the Board of Directors, may attend meetings.

Article XIII

Amendment

These by-laws or the Articles of Incorporation may be amended at any regular meeting of the Board of Directors by the affirmative votes of not less than five members of the Board of Directors or at any special meeting of the Board of Directors convened for the purpose by the affirmative votes of not less than five members of the Board of Directors.

At the same meeting of the Board of Directors at which the above

by-laws were adopted, the following temporary officers were elected and charged with the responsibility of getting the Foundation under way and carrying it through its initial period of development:

President ..... Willard E. Hotchkiss
Vice President ..... Charles W. Hills, Jr.
Treasurer ..... Robert B. Harper
Secretary ..... Homer H. Cooper

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Mr. Homer H. Cooper and Mr. C. Paul Parker were designated as counsel.

At a meeting of the Board held on June 10, 1936, Mr. Cunningham asked to be relieved of membership on the Board of Directors. His resignation was accepted with regret, and the President was instructed to inform Mr. Cunningham that, at all meetings of the Board of Directors, he is invited to be present so long as he is Chairman of the Board of Trustees of Armour Institute of Technology.

Mr. Charles S. Davis was elected to membership in the Corporation and in the Board of Directors of the Foundation.

Because of pressure of other obligations, Mr. Cooper asked to be relieved of the duties of Secretary and of membership in the Board of Directors, but expressed a willingness to continue his service to the Foundation as counsel. Whereupon Mr. Cooper's resignation was accepted, and Mr. C. Paul Parker was elected Secretary. At the same meeting, the office of Assistant Secretary was created, and filled by the election of Professor Joseph B. Finnegan.

At a meeting of the Board of Directors held on August 24, 1936, the office of Executive Director of the Foundation was created, and Dr. Thomas C. Poulter was elected to that office.

BULLETIN OF

ARMOUR INSTITUTE OF TECHNOLOGY

REPORT NUMBER

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ARMOUR INSTITUTE OF TECHNOLOGY

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PRESIDENT'S REPORT
FOR YEAR ENDED AUGUST 31, 1938

To the Board of Trustees:

The past few years have seen substantial changes in the organization and operation of the Institute. The major divisions of the Institute now are the Undergraduate College of Engineering and Architecture, the Graduate Division, the Evening Division, and the Research Foundation. A separate report of the Research Foundation is included in this publication. The activities of the other divisions of the Institute for the year ended August 31, 1938, are presented in the following statement.

CURRENT OPERATION

Administrative Staff

Dr. Willard E. Hotchkiss resigned as President in October, 1937, and the writer served as Acting President until his election to the presidency in May, 1938. At that time, Dr. Charles A. Tibbals, formerly Associate Dean, was appointed Dean of the Undergraduate College. Professor Henry P. Dutton, Chairman of the Department of Social Science, was appointed Dean of the Evening Division, to succeed Dr. B. B. Freud, who resigned this position to become Chairman of the Section of Chemistry.

To correlate properly the public relations activities of the Institute, Professor David P. Moreton, for more than thirty years Professor of Electrical Engineering, was appointed Director of Public Relations. In this capacity, he has general responsibility for public contacts in connection with promotional activities, publicity, placement, and alumni service. Professor John J. Schommer was appointed Director of Placement, effective at the beginning of the academic year 1938-39, and took over the work which had been carried on since 1934 by Mr. William N. Setterberg, who became Registrar for the Evening Division. Since a much larger proportion of the time of Professor Schommer has been allotted to placement than was the case with Mr. Setterberg, it is expected that placement activities will be greatly extended both in scope and effectiveness.

Mr. A. B. Lewis, formerly Headmaster at the Northwestern Military and Naval Academy, was appointed Assistant to the President on July 1, 1938, and is concentrating his work on fund-raising activities.

Department of Architecture

In 1936, when Professor Earl H. Reed resigned as Director of the Department of Architecture, an Advisory Committee on Architecture, consisting of prominent Chicago architects, was formed. This Committee, which was made up of John A. Holabird, of Holabird and Root, Chairman; Alfred S. Alschuler, of Alfred S. Alschuler, Inc.; C. Herrick Hammond, of Burnham Brothers and Hammond; Jerrold Loebl, of Loebl and Schlossman; and Alfred Shaw, of Shaw, Naess, and Murphy, carefully studied the problem of developing at Armour a school of architecture of outstanding merit, and recommended the appointment of Ludwig Mies van der Rohe, world famous modern architect as director of the Department. The negotiations with Professor Mies van der Rohe, begun almost two years ago, resulted in his acceptance of the position, and on September 1, 1938, he joined the staff of the Institute, and assumed the direction of the Department. In the interim, the Department was effectively operated by Jerrold Loebl as Acting Director. Assisting Professor van der Rohe in the development of the School of Architecture are Mr. Ludwig Hilberseimer, Professor of City Planning; Mr. Walter Peterhans, Professor of Visual Training; and Mr. John B. Rodgers, Assistant Professor of Architectural Design. These staff members, together with members of the former staff of the Department of Architecture, greatly strengthen the educational program in this field, and there is every reason to believe that this Department will develop into an outstanding school of architecture, and make a very significant contribution to architectural education in America.

New Faculty Appointments

In February, 1938, Dr. Michael Sadowsky was appointed Instructor in Mathematics, and Mr. Alexander Cowie, Instructor in Mechanical Engineering. Other new faculty appointments, effective September 1, 1938, include Dr. Hans Reissner, for many years Professor of Mechanics at the Technische Hoch-

schule in Berlin, Research Professor of Engineering; Dr. John L. Miller, Associate Professor of Metallurgy; Dr. Myril B. Reed, Assistant Professor of Electrical Engineering; Dr. Sanford B. Meech, Assistant Professor of English; Mr. Merrill G. Christophersen, Instructor in English; Dr. William L. Wasley and Dr. Howard M. Kindsvater, Instructors in Chemistry; and Mr. William M. Simpson, Instructor in Civil Engineering. Dr. Haldon A. Leedy joined the staff of the Research Foundation, and became Instructor in Physics. Dr. Rufus Oldenburger resumed his duties as Assistant Professor of Mathematics after a year's leave of absence, during which he served as an Assistant at the Institute for Advanced Study at Princeton.

Promotions

Dr. William A. Pearl was promoted to Professor of Mechanical Engineering and Director of Engineering Shops; Mr. Harold A. Vagtborg to Professor of Municipal and Sanitary Engineering and Managing Director of the Research Foundation; and Dr. Carl G. Anderson to Assistant Professor of Mechanical Engineering.

Leaves of Absence

Mr. Earle L. Kent, Instructor in Electrical Engineering, was granted a leave of absence for the year 1938-39 to pursue graduate study, and Mr. Clayton O. Dohrenwend, Instructor in Civil Engineering, was granted a leave of absence for the first semester of 1938-39, for the same purpose.

Resignations

Resignations included Mr. William F. McCaughey, Associate Professor of Architectural Design; Mr. Walter L. Suter, Assistant Professor of Architectural Design; Mr. David Chapman, Instructor in Architecture; Mr. Otto Zmeskal, Instructor in Metallurgy; and Mr. Homer C. Combs, Instructor in English.

Enrollment

During the year 1937-38, the enrollment in all divisions of the Institute reached the highest figure in its history. For purposes of comparison, the following table summarizes enrollment for the past five years.

Enrollment 1933-1938

Year	College		Evening Division		Summer	Total Students
	1st Sem.	2nd Sem.	1st Sem.	2nd Sem.		
1933-34	848	817	438	403	198*	1473
1934-35	788	774	638	544	192	1690
1935-36	788	849	814	707	212	2030
1936-37	913	1030	1412	1309	218	3074
1937-38	1114	1242	2220	1787	426	4094

* Figures in this column show enrollment for the preceding academic year

Preliminary figures for the first semester of 1938-39 indicate an enrollment of 1,024 in the four-year undergraduate course, 43 full-time graduate students, and 236 in the cooperative course, making a total of 1303. Evening enrollment totals 1,819. This enrollment severely taxes the physical facilities of the Institute, and it is only possible to provide properly for these students by continued improvements in plant and equipment.

The Undergraduate College

In 1936 the principal undergraduate engineering curricula were inspected by the Committee on Engineering Schools of the Engineers' Council for Professional Development, as a part of the nation-wide program of accrediting colleges of engineering. The approved list of curricula appearing in the Fall of 1937 included the major engineering curricula at the Institute, namely Chemical, Civil, Electrical, and Mechanical Engineering. It is significant to note that Armour was the only school in the Chicago area that received this recognition.

The faculty Committee on Curricula recommended a few changes, in the undergraduate curricula providing for a better distribution of the students' time.

A feature of the work of the Undergraduate College was the further development of the student personnel program covering admissions, testing, and counselling. Dean Tibbals believes that this work is already resulting in improved accomplishment on the part of many Institute students. The Department of Educational Tests and measurements, under the direction of Dr. William C. Krathwohl, has further enlarged its scope, and is conducting interesting research. Counselling and guidance work with individual students, as well as remedial study and

classes in psychology, by Mrs. Anna C. Orcutt, proved of substantial value. It is interesting to note that the average ability of the freshman class which entered the Institute in September, 1937, as measured by the psychological examination of the American Council on Education, placed the Armour class in the upper quarter of the freshman groups in more than three hundred American colleges. This represented an improvement over the class of the previous year, and indications are that the freshman class for 1938 will show still further improvement in average ability. It has long been recognized that Armour attracted a serious student of substantial ability, and the fact that applications for admission have consistently exceeded the capacity of the college has made it possible to gradually raise the level of performance expected for entrance.

The first class in the Cooperative Course in Mechanical Engineering will start its fourth year's work in February, 1939. Cooperative students are now well established at Armour, and the response from industry in providing employment for these young men has been very gratifying. A list of the 81 companies now participating in the plan is included in Appendix I.

The Institute's student aid program, including four-year scholarships in Fire Protection Engineering, competitive freshman scholarships, endowed senior scholarships, student service paid for by credit toward tuition, and about $8,000 in Federal funds under the National Youth Administration, which made it possible for many students of unusual competence to attend who could not have done so without aid, reached a total of nearly $42,000.

The need for additional undergraduate scholarships to provide opportunities for young men of exceptional ability with limited finances, especially those between the freshman and the senior years, should again be emphasized. In recognition of this need, Mr. Frederic Clay Bartlett, Jr., of the Class of 1934, established the Dora T. Bartlett Memorial Scholarship to be awarded annually to a student in architecture.

Evening Division

The Evening Division, under the direction of Dean B. B. Freud, enjoyed the greatest year in its history. In the first semester of

1937-38, 115 classes were given in 77 different subjects. These classes were conducted by 73 instructors, of whom 24 were engaged exclusively for the Evening Division, and the balance were regular members of the Institute staff, teaching evening classes as a part of the regularly assigned load. During the year every available classroom at the Institute was in use for evening classes.

Two developments of more than ordinary interest occurred during the year in the Evening Division. One of these was the establishment of three nonresident classes in metallurgy given in cooperation with the American Steel and Wire Company in Waukegan, Illinois. This venture aroused much interest, and it seems to point the way for a broadening of the service which the Institute can render through its Evening Division by inviting extension classes at points where workers are concentrated.

The second significant development was the organization of a substantial group of Evening Division students into a functioning students' association. The formation of such an organization indicates that there is a group of men undergoing the disciplines of a college training under the handicap of being simultaneously employed on a full-time basis, who still have enough energy and interest to organize themselves for extracurricular activities, exactly as the more conventional college students do. Certainly this is a challenge to the Division to continue to make constructive contributions toward providing educational opportunities worthy of such earnest men.

The report of the Dean of the Evening Division carries detailed statistics showing the places of employment of the evening students, and it is significant to note that the companies listed cover practically the entire range of industrial activity in Chicago. Some of the largest employers of Evening Division students were Carnegie-Illinois Steel Corporation with 90; Commonwealth Edison, 89; Western Electric, 77; International Harvester, 66; Crane Company, 49; Link-Belt, 38; Pullman Company, 31. Many other organizations furnished 10 or more students for the Division. It is interesting to reflect that the Evening Division not only serves the individual students but also makes an important contribution to industry by providing the necessary training in the basic sciences and in engineering for its employees.

Graduate Division

The Graduate Division of Armour Institute of Technology was established in September, 1937, with Dean Linton E. Grinter in charge. Two years previously graduate study had been carried on under the direction of an administrative committee, consisting of Professors Freud, Freeman, and Peebles. The major objective of the first year of the existence of the Division was to establish policies and standards that will last through many years. Every effort has been made to raise standards of graduate study and of graduate research, and to improve thesis writing. As part of their work, the Graduate Division and the Committee on Graduate Study have accepted the obligation of maintaining standards for the professional degrees.

The growth of graduate enrollment, particularly in the evening classes, has been rather startling. For three successive years, the rate of increase has been nearly 100 per cent yearly. Obviously, this cannot continue, since Armour already has one of the largest evening registrations of engineering graduate students in the country. This rapid growth does, however, indicate the accumulated demand for advanced study that has developed in the Chicago area, which Armour's evening graduate classes can serve most effectively. Registration of graduate students in day classes has shown a steady increase but there are certain factors, not under the control of the faculty, that limit such registration. It is an accepted practice in the United States to subsidize engineering graduate study by the establishment of scholarships, fellowships, and teaching and research assistantships. The extent of this practice will be evident when it is noted that the number of such engineering graduate awards throughout the country in 1937 was almost exactly equal to the number of master's degrees conferred. The development of a substantial enrollment of graduate students in day classes at Armour Institute of Technology will depend upon the funds which can be made available for such grants. Some progress has been made in this direction by the appointment of a number of half-time graduate assistants to assist the regular faculty members in instruction and research, particularly in laboratory courses. Robert I. Wishnick, '14, a member of the Board of Trustees, established the Eli Wishnick research fellowship in

1937. The Universal Oil Products Company has continued to provide two research fellowships, and the G. S. Rogers Company established two graduate fellowships for the year 1938-39. It is hoped that other individuals and corporations may desire to finance additional graduate students.

A separate catalog of the Graduate Division was published, for the first time, for the year 1938-39. This catalog contains a complete description of all graduate courses in both the day and evening, together with the requirements for graduate degrees.

An important secondary function of the Division, as visualized by Dean Grinter, is to sponsor faculty research. The line of distinction between research and graduate teaching is difficult to draw. Good graduate teaching presupposes ability and interest in research, while accomplishment in research is almost proof of ability to teach and guide graduate students.

Naturally, the type of research sponsored through the Graduate Division would be largely of a fundamental or pure research nature, since the Research Foundation is engaged principally in industrial research. It does not, however, seem desirable at this time to draw a hard and fast distinction between the activities of the Graduate Division and those of the Research Foundation, and the greatest accomplishment for the Institute for some time to come will probably result from close cooperation between the two activities.

The Graduate Division has also undertaken to establish a publication outlet for the results of research of the Armour faculty. The completion of a series of tests on a precast-slab system of floor construction furnished the information for the initial technical bulletin of Armour Institute of Technology, entitled "Tests of a Precast-Slab Floor Panel". Additional bulletins of this type will be published as research contributions become available.

Research Foundation

The report of the Research Foundation gives a detailed account of its activities during the past year. It is, however, important to note that substantial progress has been made in the organization and procedures followed in the Research Foun-

dation, and that the appointment of Professor Harold A. Vagtborg as Managing Director, has supplemented Dr. Poulter's activities as Director of Research in a very effective way.

Public Activities of the Institute

During the past year, the Institute has engaged in numerous activities of a public and professional nature, which have proven of significant value to the community. One of the most important of these was the Midwest Power Conference held April 13-15, in cooperation with the engineering schools of the state colleges and universities in Illinois, Indiana, Iowa, Michigan, and Wisconsin. The work of organization of this conference, at which more than 30 papers were presented, and which had an attendance of over 400, was carried on largely by the members of the Armour staff, under the direction of Dean L. E. Grinter as Conference Director and Professor Stanton E. Winston as Conference Secretary. It is expected that this conference will be held annually in Chicago, under the sponsorship of Armour Institute of Technology.

The conference course for industrial executives, started in 1936, was continued in 1937, with "Executive Control of Personnel" as the subject. Twenty-five corporations enrolled in this conference, and provided an average attendance of 70 persons at the 12 weekly dinner meetings. The detailed work of organization and operation of this program was carried on by Professor Henry P. Dutton.

Members of the staff of the Institute conducted a survey of in-service training in Chicago for the Education Committee of The Chicago Association of Commerce, and presented a detailed report of their findings to this Committee. This report, written by Professors Finnegan and Dutton, has been made the basis for further study by the Association of Commerce, and may point the way to significant activities in the field of in-service training on the part of the Association and the Institute.

A six weeks' Conference on Welding Design and Practice, consisting of lectures and discussions by authorities in various phases of welding, was carried on at the Institute during December and January, in cooperation with the Hollup Corporation.

One of the most enjoyable events of the year was a dinner held January 19, 1938, to commemorate the award of the Congressional Medal to Dr. Thomas C. Poulter. More than 400 persons attended this dinner at the Palmer House.

The final conference of the year was held at the Institute in June, 1938, in cooperation with the Civil Engineering Division of the Society for the Promotion of Engineering Education, and dealt with structural practice. About 60 teachers of structural engineering from colleges of engineering all over the United States were in attendance.

The Institute carried on a series of weekly radio programs on Station WCFL, throughout the year. Mr. Alexander P. Schreiber, working with various members of the faculty, presented in a popular way many new and interesting developments in engineering and applied science.

The "Armour Engineer and Alumnus", under the direction of Professors David P. Moreton and Walter Hendricks, has continued to prove an exceptionally effective medium of publicity, while at the same time maintaining a high standard for college publications. More than 20,000 copies of the May, 1938, issue were distributed.

Many members of the Armour faculty were called upon to visit high schools in the Chicago area to discuss engineering education. General newspaper publicity about the activities of the Institute, directed by Professor Joseph B. Finnegan and Mr. Alexander P. Schreiber, has continued to show substantial improvement. Dr. Poulter and Professor Schommer have been called upon by a large number of groups and societies for lectures of popular interest. Similar talks have been given by other faculty members on a somewhat more limited scale.

Professional Activities of Staff Members

The following list of professional activities of faculty members is not complete but is to a large extent typical. Papers and discussions have been presented before the Western Society of Engineers by Professors Dutton, Thompson, Grinter, Stevens, Ensz, Dohrenwend, and the President. Professor Freud was Vice Chairman of the Chemical and Metallurgical Section of

the Society as well as a member of the Education and Program Committee. The President served as Chairman of the Bridge and Structural Section and Chairman of the Program Committee. One meeting of the Western Society of Engineers was held at the Institute.

The Society for the Promotion of Engineering Education, of which more than 40 of the staff are members, has engaged the attention of many faculty members, both at the meeting of the Illinois-Indiana Section and the national convention held at College Station, Texas. Papers were presented at the national meeting by Professors Grinter, Vagtborg, Kintner, and the President. Professor Kintner was elected Chairman of the Chemical Engineering Division, and Professor Vagtborg Chairman of the Sanitary Engineering Committee of the Civil Engineering Division. Dean Grinter completed a three-year term as a member of the National Council, and served during the year as Chairman of the Committee on Library Facilities of the Civil Engineering Division. Professor McCormack served as Chairman of the Laboratory Committee of the Chemical Engineering Division, and the President continues as Director of the Civil Engineering Division, as Chairman of its Committee on Educational policy, and was elected a member of the Council for a three-year term. At the sectional meeting held at Terre Haute, Indiana, Professors Spears, Sear, Hendricks, Spencer, Hammett, Seegrist, McCormack, Pearl, Kintner, and Vagtborg appeared on the program.

Professors Freud, Komarewsky, McCormack, Poulter, and Jakob have presented discussions and papers before local and national meetings of the American Chemical Society. Professor Jakob also appeared on the program of the American Institute of Chemical Engineers in May, 1938, and the student branch arranged one meeting of the Chicago Chapter at the Institute. Professor Freeman has served as a member of the Educational Committee of the Chicago Section of the American Institute of Electrical Engineers. The student branch of this society entertained the Chicago Section at a meeting at Armour. Professor Carpenter has been Chairman of the Student Relations Committee of the Chicago Section of the American Institute of Mining and Metallurgical Engineers. Professor Dutton presented a discussion before the Spring Conference

of the American Management Association, and participated in the Conference of the Industrial Management Society. Papers were presented before the American Mathematical Society by Professor Ford and Mr. Leckrone. Professor Vagtborg continued to serve as Secretary of the Chicago Chapter of the American Public Works Association. Professor Ensz served as a member of the Committee on Roadway and the Committee on Iron and Steel Structures of the American Railway Engineering Association. Professor Peebles is a member of the Committee on Insulating Materials for the American Society for Testing Materials, and Professor Paul is Chairman of a Subcommittee on Timber Specifications for the same Society. Discussions were presented before the American Society of Mechanical Engineers by Doctors Jakob and Poulter, and Mr. Goetz. Dr. Jakob is a member of the Special Research Committee on Thermal Properties of Steam, and Professor Roesch is a member of the Board of the Chicago Section. Mr. Goetz is Assistant Chairman of the Management Division of the Chicago Section.

Professor Penn presented a paper at the annual convention of the Illinois Society of Engineers, and has been a member of the Committees on Surveying and Membership of this organization. Professor Krathwohl presented a discussion before the Men's Mathematics Club of Chicago. Other members of the mathematics staff have been active in this group. Professor Thompson served as Chairman of the Program Committee of the Physics Club of Chicago, and was elected a Vice President and Director for 1938-39. Dr. Poulter was Vice President for 1937-38, and was elected a Director for 1938-42. Professor Dutton served as Secretary and Vice President for the western area of the Society for the Advancement of Management, and presented discussions before the Chicago Chapter. Mr. Goetz is a member of the Executive Committee of the Chicago Chapter. The Institute has been represented in the Society of Automotive Engineers by Professor Roesch, who is a member of the National Fuels Committee, of the Board of the Chicago Section, and Chairman of the Diesel and Tractor Division. Professor Hansen lectured on "Unemployment Compensation" before the Industrial Relations Association and numerous other industrial groups. Dr. Poulter was Vice President of the Geographic Society of Chicago. Professor Pearl presented papers before the American Gas Associa-

tion Convention and the Solid Fuel Convention. Professor Copeland appeared on the program at the Annual meeting of the American Association of Science, and presented two papers at the Iowa Colloquium for College Physicists. Mr. Potter presented a paper before the University of Chicago Physics Club.

A list of publications of faculty members during the year 1937-38 is included in Appendix II.

Several members of the faculty have carried on graduate study and research during the summer vacation period. Professor Mangold was engaged at the University of Iowa in teaching and research in hydraulics. Summer teaching ordinarily done by Professor Mangold at Armour was carried on by Mr. Edward Soucek of the University of Iowa. Professors Stevens and Spears, and Mr. Dohrenwend attended the University of Michigan. Dr. Ziegler did advanced work at Massachusetts Institute of Technology, and Dr. Sprague carried on a special research program at Ohio State University. Messrs. Fulghum and Olson of the Department of English worked toward advanced degrees at Northwestern University and the University of Chicago, respectively, and Mr. McLarney has continued his program of study toward the doctorate.

BUILDINGS AND EQUIPMENT

Gifts of Property

Property owned by the Institute was augmented during the year by the gift of the Glessner House, 1800 Prairie Avenue, and by the gift of a piece of vacant property on Michigan Avenue, donated by Mr. S. B. Chapin. The Glessner House was built in 1885, at a cost of $250,000, as the home of the late Mr. John Jacob Glessner, formerly Chairman of the Board of the International Harvester Company. It is particularly interesting because it is the last remaining example in Chicago of the work of Henry Hobson Richardson, eminent American architect. The House was acquired by the Institute on April 1, 1938, and since that time has been used as a branch of the Human Engineering Laboratory operated for many years at Stevens Institute of Technology. The Institute is indebted to Mrs. Frances G. Lee and the other heirs of Mr. Glessner for this gift.

Student Union

Armour students have long been in need of more adequate facilities for recreation and comfort. Plans to meet this need materialized during the year through the activities of leaders of the student body in advocating the establishment of a student union. It was decided to rehabilitate Armour Mission and to devote this building exclusively to student union purposes. The student body voted to assess themselves a student union fee of $3 per semester, to cover the cost of rehabilitation and operation of the student union, and the Board of Trustees authorized the issuance of $40,000 in debenture bonds to provide funds for construction. At the same time, the Board of Managers of the Alumni Association made plans for offering the alumni an opportunity to contribute to the furnishings for the building, thus making the student union a reality. Contracts for the remodeling were let to R. C. Wieboldt Company in August, and the work will be completed in October. The building will contain a modern restaurant, meeting rooms, student lounge, and auditorium, thus fulfilling a long felt want at Armour. Plans for the remodeling were prepared by Loebl and Schlossman, Architects, and the work at the Institute in connection with development and execution of the program is being carried out by Professor David P. Moreton. Professor Walter Seegrist served as consultant on engineering features.

General Improvement of Buildings and Equipment

Two years ago a program of systematically improving the Institute plant was undertaken, and this work has been continued during the past year. Substantial remodeling has been done in Chapin Hall and the Physics Building, and a new boiler was installed in the power plant. Library stacks which have long been inadequate were replaced by modern double-decked steel stacks, and now provide much increased book capacity. The campus and exterior of the buildings have been improved by landscaping and by the painting of the rear walls of Chapin Hall and the Physics and Research Buildings. Considerable new equipment has been added in the Department of Chemical Engineering and the engineering shops, while a photo-elastic laboratory has been established in the Department of Civil Engineering. The Research Foundation has continued to make

improvements in its building and additions to its equipment. Many manufacturers have made valuable contributions of equipment to the various laboratories during the year. Other improvements in the Institute plant are still needed, and it will be necessary to continue to spend a considerable amount of money each year in order to maintain buildings and equipment in proper working condition.

ALUMNI

A placement service is maintained at the Institute to encourage contacts between prospective employers and students and alumni. The demand for graduates is directly proportional to general business conditions but, even during depression years, employment has been available for a large proportion of technical men. It is expected that further development of the placement office, under the direction of Professor Schommer will increase the effectiveness of the service which the Institute can render to industry and to its graduates.

Complete alumni records are now being collected and maintained by the clerical staff under Professor Moreton's direction as alumni representative, and a new alumni directory is in process of compilation.

Reference has already been made to the perpetual giving plan of the Alumni Association. This plan, which is being developed by a committee of alumni, will present an opportunity for each alumnus to make an annual gift to his Alma Mater. Contributions are to be assigned to a specific purpose each year by action of the Board of Managers of the Alumni Association.

FINANCIAL REVIEW

Armour Institute of Technology is financed by income from tuition, income from endowment and miscellaneous non-educational activities, and by gifts to the annual sustaining fund. During the years 1934-35, 1935-36, and 1936-37, the total income did not equal total expenditures, and the year 1937-38 was begun with an accumulated carry-over of $68,000. During this year contributions to the sustaining fund increased 50 per cent, and there was a substantial increase in operating income due largely to increased registration in the Evening Division. Total income from all sources, exclusive of the Research Foundation, was

$546,779, while total expenditures were $526,726. This presents a rather satisfactory operating picture, and enables some progress to be made on the retirement of the accumulated deficit.

Grateful recognition is hereby given to the companies and individuals who contributed the funds so necessary for the operation of the Institute during the year. Continued contributions from this group together with the help which may be enlisted from others will provide the increased sustaining fund necessary to support the improved program during the coming year. However, it should be emphasized that more rapid progress in developing Armour Institute of Technology into the outstanding college of technology visualized by its Board of Trustees, and which Chicago and the Middlewest so richly deserves, can only come through major gifts for buildings and equipment, endowment, and scholarships.

BOARD OF TRUSTEES

The membership of the Board of Trustees was changed by the death of one member, the withdrawal of two members, and the election of four new members. The Institute lost a valued friend and one of Chicago's leading citizens by the death of Mr. James O. McKinsey, Chairman of Marshall Field and Company, and trustee since 1935. Mr. Roy M. Henderson and Mr. George W. Rossetter relinquished their membership at the expiration of their term in October, 1937. Mr. Raymond J. Koch, of the Class of '13, President of Felt & Tarrant Manufacturing Company, and Mr. William T. Morris, President of the American Chain and Cable Company, were elected at the October meeting. Mr. Charles H. Strawbridge, President of Goodman Manufacturing Company, and Mr. Bernard L. McNulty, President of Marblehead Lime Company were elected at the January meeting.

At the May meeting, the by-laws were amended to provide for the election to the Board of Trustees of an alumnus each year on nomination of the Alumni Association. This amendment provides a definite means for following the procedure that had already been established of providing alumni representation on the Board. Mr. Harold S. Ellington, '08 of Harley and Ellington, Architects and Engineers, Detroit, Michigan, was

selected by the alumni, and will be elected for a three-year term in October, 1938.

Members of the Board, individually and collectively, have aided the Institute in ways so numerous that not all of them can be mentioned.

The Executive Committee has met frequently throughout the year, and its members have given unstintingly of their time and energy in the service of the Institute. Members of the Board of Trustees, and particularly Messrs. Cunningham, Alschuler, Eustice, and Hammond, are largely responsible for the financial support received during the year. Messrs. Hammond, Koch, and McNulty have accepted membership on the Board of Directors of the Research Foundation, and have actively assisted the other directors in the development of policies, and in supporting research projects. Mr. Stuyvesant Peabody has continued to support work in the Research Foundation, and Mr. Robert I. Wishnick has made possible the publication of "The Frontier".

Mr. Homer H. Cooper, as General Counsel, has efficiently handled all legal problems of the Institute, and Mr. Newton C. Farr has rendered outstanding service in handling real estate and mortgages. Mr. Sanger has made a valuable contribution in developing satisfactory features for budgetary control. The newly organized Committee on Development, under the chairmanship of Mr. Eustice, promises to be particularly important in the future of the Institute. Mr. John J. Mitchell made possible a valuable study of aims and activities of the Institute, carried out during the year by McKinsey, Wellington & Company.

Other friends of the Institute outside the Board of Trustees made valuable contributions to the advancement of its program. Particular recognition is due Mr. S. B. Chapin and Mrs. J. Ogden Armour for their continued help and encouragement.

CONCLUSION

Although this report has already given recognition to numerous important services rendered by members of the Board of Trustees, faculty, student body, and alumni, it would not be complete without pointing out that there has been no discussion of factors, neither new nor conspicuous, which have been vital to the continuing success and growth of the Institute, namely, the day-by-day competent and loyal service of the staff—admin-

istrators, teachers and employes. Armour's strength lies in the service it has been rendering to the community since its inception in 1892 and in the service it is prepared to continue to render. This service is effective only through the close cooperation of the Board, the faculty, the student body, and the alumni. The existence of this spirit of cooperation is evidenced by the accomplishments of the past. The development of Armour into its position of rightful leadership in technical education presents a challenging opportunity for our continued efforts.

Respectfully submitted,

Henry Townley Heald,
President.

RESEARCH FOUNDATION
of
ARMOUR INSTITUTE OF TECHNOLOGY

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SECOND ANNUAL REPORT TO THE BOARD OF DIRECTORS RESEARCH FOUNDATION OF ARMOUR INSTITUTE OF TECHNOLOGY

The following report covers the activities of the Research Foundation for the year ending August 31, 1938.

Board of Directors and Officers

At a regular meeting of the Board of Directors on June 3, 1938, General Thomas S. Hammond was elected President and a member of the Board of Directors of the Foundation to fill the vacancy caused by the resignation of Dr. Willard E. Hotchkiss.

At this meeting Mr. Alfred L. Eustice, a director, expressed his desire to resign from the board so that someone else could serve as a director and have intimate contact with the growing importance and responsibility of the Foundation. His resignation was accepted with keen regret and only after he had stated his willingness to again become a director when the directorate was increased.

Mr. Bernard L. McNulty and Mr. Raymond J. Koch were elected as directors to fill the vacancies caused by the resignations of Mr. Homer H. Cooper and Mr. Alfred L. Eustice.

In November, 1937, Mr. Harold Vagtborg was appointed Associate Director of the Foundation to relieve Dr. Thos. C. Poulter, Executive Director, of the management aspects of the Foundation so the latter's time could be devoted entirely to the direction of research projects.

At the June 3, 1938, meeting, the offices of Director of Research and Managing Director were created to replace the offices of Executive Director and Associate Director. Dr. Poulter and Mr. Vagtborg were elected to these offices, respectively.

Division of Activities

To permit the broadest possible use of its facilities by both large and small organizations, the activities of the Foundation have been separated into two divisions.

The experimental engineering division enables the use of the general laboratories and facilities of the Foundation for short-term studies and special tests. This division undertakes investigations in the various fields of applied science and engineering. These may involve from an hour to several months of time and charges are made accordingly. The special training and wide experience of the general staff of the Foundation have, in numerous cases, enabled it to solve important industrial problems assigned to this division.

In the industrial research division is centered the major activity of the Foundation. The Foundation is equipped to serve as a research department for the industry which has no research facilities of its own. It is particularly adapted to serve the industry which already maintains a research organization by the carrying out of long-term programs of the type which are frequently interrupted by emergency demands. Where such long-term programs are carried on in an isolated laboratory, no emergency interruptions occur. The necessary facilities are definitely allocated to the project until the work has been completed. Meanwhile the regular research facilities of the manufacturer can readily be diverted for use on work of a rush character.

The Foundation is also conducting a number of fundamental research investigations as a contribution to scientific knowledge. In several cases this work is partially underwritten by organizations interested in sponsoring scientific development.

Service Statistics

Prior to September 1, 1936, 424 companies, associations of manufacturers and individuals utilized this research and experimental engineering service. During the period from September 1, 1936, to August 31, 1938, 287 additional names were added to this list, bringing the total to 711. During this two-year period fifty-two industrial research projects were undertaken. The publishable portion of this list is appended.

A study of the list of companies utilizing the service of the experimental engineering division reveals that over fifty per cent of them repeat regularly several times each year and many oftener. One company averages over 100 investigations per year. In the industrial research division two companies have

undertaken five projects with the Foundation, another company three projects, and two companies two projects each, during the two-year period ending September 1, 1938.

The following organizations have agreed to the publication of their names as a partial list of sponsors of long-term industrial research projects undertaken at the Foundation since January 1, 1938:

Acme Steel Company
Allis-Chalmers Manufacturing Co.
Armour and Company
Clay Products Association
Club Aluminum Products Company
Felt & Tarrant Manufacturing Co.
Marblehead Lime Company
Peabody Coal Company
Sears, Roebuck & Company
Stewart-Warner Corporation
Universal Oil Products Company
S. J. Walker
W. M. Welch Manufacturing Company
Whiting Corporation

Publications

In June, 1937, the Foundation published a general information bulletin entitled, "Research—A Service to Industry" which is available upon request.

The first of a series of technical bulletins has just appeared entitled, "Precast-Slab Floor Panels". Two others are in preparation, one relating to heat transfer and the other to high octane fuels. The publication of research findings will be limited in general to partially or non-subsidized investigations except in those instances where sponsors of wholly subsidized projects allow publication because of the general scientific value of findings.

As a publication of general scientific research interest the Foundation publishes THE FRONTIER which is distributed, without charge, five times each year to industrial executives and research workers.

General Policy

On January 1, 1938, the Foundation adopted a fixed schedule of charges. In the experimental engineering division fees for services are determined in advance and depend upon the time, facilities and personnel involved. In the industrial research division the standard fee for a research project is $500 per month and except in special cases the project is underwritten for a minimum period of six months. This charge covers a suitable

laboratory, all available required equipment, the full-time services of one research worker or the equivalent, general supervision by the Director of Research, and, in addition, such service of the general staff as is deemed necessary to properly expedite the investigation to the best interests of the sponsor. Occasionally a half-time project is underwritten at $300 per month.

Each project is guided by an advisory committee which includes sponsor representation. The field of investigation embraced by an industrial research project is reserved exclusively for the benefit of the sponsor for the duration of the project. Agreements covering industrial research projects provide for patent rights, monthly and final reports, and the execution of the investigation and treatment of findings in strict confidence.

Respectfully submitted,

HAROLD VAGTBORG
Managing Director

RESEARCH PROJECTS AT RESEARCH FOUNDATION OF ARMOUR INSTITUTE OF TECHNOLOGY SINCE SEPTEMBER, 1936

NO.	PROJECT NAME	PROJECT STAFF	PROJECT STATUS
1	COAL WASHABILITY SURVEY	R. D. Snow (Ph.D., University of Iowa) Louis Siegel Bernard Gamson Edward Wagner James Dunne David Rest	Completed
2	COAL STOKERS	W. A. Pearl (Ph.D., University of Michigan) Reginald Bush John Damiani Sidney Miner H. L. Appel W. P. O'Brien H. Crapple Gerald Anderson	In Progress
3	ELECTRICAL CHARACTERISTICS OF BETHANIZED STRAND	D. E. Richardson (M.S., University of Chicago) Donald Fleig	Completed
4	HIGH OCTANE FUELS	V. I. Komarewsky (Ph.D., Moscow Imperial University) Charles H. Riesz N. Balai N. Gerber Geo. Thodos	In Progress
5	FILTRATION	Harry McCormack (M.S., University of Illinois) O. A. Hougen (Ph.D., University of Wisconsin)	Completed
7	X-RAY DIFFRACTION	G. E. Ziegler (Ph.D., University of Chicago)	Completed
8	MOTOR FUELS	Daniel Roesch (M.E., Armour Institute of Technology) Edmund Wojtasik Douglas Ewing H. M. Meyer	Completed
9	FLEXIBLE COUPLINGS	Daniel Roesch (M.E., Armour Institute of Technology) Chester C. Frae	Completed
10	BATTERY ELECTROLYTE	C. A. Nash (B.S., University of Illinois)	Completed

NO.	PROJECT NAME	PROJECT STAFF	PROJECT STATUS
13	PLASTICS	Ralph H. Manley (Ph.D., University of Iowa)	Completed
14	CELLULOSE	Harry McCormack (M.S., University of Illinois) Robert M. Levy	Completed
15	PAINT STICK	Ralph H. Manley (Ph.D.. University of Iowa) Ernest W. Hull	Completed
17	LAMP MANTLES	W. W. Colvert (M.A., Cumberland University)	Completed
18 19 20	GENERAL INSULATION PROBLEMS	J. C. Peebles (M.M.E., Cornell University) C. G. Anderson (Ph.D., University of Michigan)	In Progress
21	E. P. LUBRICANT	Thos. C. Poulter (Ph.D., University of Chicago) A. O. Walker (Ph.D., University of Chicago)	Completed
24	CYLINDER HEAD	Daniel Roesch (M.E., Armour Institute of Technology)	Completed
25	CAVITATION EROSION	A. W. Sear (M.E., Armour Institute of Technology)	In Progress
26	ANTIFREEZE SOLUTION	Harry McCormack (M.S., University of Illinois) Robert M. Levy	Completed
29	STOKER COAL	W. A. Pearl (Ph.D., University of Michigan) Reginald Bush John Damiani Sidney Miner	Completed
30	CONCRETE SLAB	L. E. Grinter (Ph.D., University of Illinois) Wm. Simpson J. F. Harding	In Progress
31	MONO-MOLECULAR FILMS	G. E. Ziegler (Ph.D., University of Chicago)	In Progress
32	BENZOL PLANT FIRE HAZARDS	Thos. C. Poulter (Ph.D., University of Chicago) J. B. Finnegan (S.B., Massachusetts Institute of Technology)	Completed
33	COOKING UTENSILS	J. C. Peebles (M.M.E., Cornell University) C. G. Anderson (Ph.D., University of Michigan)	Completed
34	TEMPERATURE OF CATALYSTS	Max Jacob (Dr. Ing., Technische Hochschule, Munich) James Prochaska	In Progress
35	OIL VISCOSITY UNDER EXTREME PRESSURES	Thos. C. Poulter (Ph.D., University of Chicago) A. O. Walker (Ph.D., University of Chicago)	Completed

NO.	PROJECT NAME	PROJECT STAFF	PROJECT STATUS
36	DOLOMITE	R. C. Kintner (Ph.D., Ohio State University) Louis Siegel George Bjornstad	In Progress
37	TEXTILE PLANT OPERATION	Harry McCormack (M.S., University of Illinois)	Completed
38	LABORATORY WARE	A. O. Walker (Ph.D., University of Chicago)	In Progress
39	HEAT TRANSFER TUBES	Max Jakob (Dr. Ing., Technische Hochschule, Munich) P. FitzPatrick	Completed
40	HEAT RESISTANT GASKETS	Ralph H. Manley (Ph.D., University of Iowa) F. W. Godwin (Ph.D., University of Iowa)	Completed
41	COLLOIDAL FUEL	F. W. Godwin (Ph.D., University of Iowa) Louis Siegel	In Progress
42	ZINC ELECTRO-PLATING	P. L. Copeland (Ph.D., University of Iowa) Thomas W. Doub	In Progress
43	CRANE BRAKES	Thos. C. Poulter (Ph.D., University of Chicago) P. FitzPatrick	In Progress
44	GRAIN STORAGE	C. G. Anderson (Ph.D., University of Michigan) P. FitzPatrick (B.S., University of Notre Dame) Irwin Fieldhouse	In Progress
45	ANTIFREEZE SOLUTION	A. O. Walker (Ph.D., University of Chicago)	In Progress
46	HEATING EQUIPMENT	Max Jakob (Dr. Ing., Technische Hochschule, Munich) Kenneth A. Rees Eugene Sallenbach	In Progress
47	PROCESSING OF HEMP	Harry McCormack (M.S., University of Illinois) Robert M. Levy	In Progress
48	CLAY PIPE JOINTS	Ralph H. Manley (Ph.D., University of Iowa) H. M. Kindsvater (Ph.D., University of Iowa)	In Progress
49	LIGNITE	F. W. Godwin (Ph.D., University of Iowa)	In Progress
50	MANGANESE	A. H. Carpenter (A.M., Ohio University)	In Progress
51	COMPUTING MACHINES	H. A. Leedy (Ph.D., University of Illinois)	In Progress
52	COAL DRYERS	F. W. Godwin (Ph.D., University of Iowa) Douglas P. Meigs	In Progress

NOTE: Project numbers which have been omitted are unannouncable investigations.

APPENDIX I

THE COOPERATIVE COURSE IN MECHANICAL ENGINEERING

Cooperating Companies

Acme Steel Company
Alemite Die-Casting Co., Woodstock.
W. D. Allen Mfg. Co.
All-Steel-Equip Co., Aurora.
American Can Co., Western Ave.
American Forge Co.
American Manganese Steel Co., Chicago Heights.
American Steel Foundries, Chicago Office
American Steel Foundries, East Chicago, Ind.
American Steel Foundries, Hammond, Ind.
Appleton Electric Co.
Armour & Co.
Armstrong-Blum Mfg. Co., Inc.
Automatic Transportation Co.
Barber-Colman Co., Rockford.
Barber-Greene Co., Aurora.
W. F. & John Barnes Co., Rockford.
Bell and Howell Co.
Buda Co., Harvey.
H. W. Caldwell & Sons, Co.
Carnegie-Illinois Steel Corp.
Caterpillar Tractor Co., Peoria.
Central Scientific Co.
Chicago Screw Co.
Chicago Surface Lines, 3901 West End Ave.
Commonwealth Edison Co.
Container Corp., 1301 W. 35th St. and 900 N. Ogden Ave.
Corn Products Refining Co., Argo.
Crane Co.
Crowe Name Plate Co.
Curtiss Candy Co.
Danly Machine Specialties, Inc.
Delta Star Electric Co.
Elgin National Watch Co., Elgin.
Farrell Mfg. Co., Joliet.
Felt & Tarrant Mfg. Co.
Foote Bros. Gear & Machine Corp.
Gaertner Scientific Corp.
Goodman Mfg. Co.
Great Lakes Forge Co.
Greenlee Bros., Rockford.
B. F. Gump Co.
The Hallicrafters, Inc.
Howe Ice Machine Co.
Ilg Electric Ventilating Co.
Illinois Tool Works
Inland Steel Co.
Interlake Iron Corp.
International Register Co.
Jefferson Electric Co.
W. A. Jones Foundry & Machine Co.
Edward Katzinger Co.
Link Belt Co.
Liquid Carbonic Co.
Lyon Metal Products, Inc.
Mall Tool Co.
Mercoid Corp.
Mercury Mfg. Co.
Miehle Printing Press & Mfg. Co.
Mills Novelty Co.
John Mohr and Sons
Morton Mfg. Co.
Public Service Co., Maywood.
Pyle-National Co.
Pyott Foundry & Machine Co.
Quam Nichols Co.
Raymond Bros. Impact Pulverizer Co.
Republic Flow Meters Co.
Republic Steel Corp.
Revere Copper & Brass, Inc.
Schweitzer and Conrad
Speedway Mfg. Co.
Stephens-Adamson Co., Aurora
Stewart Die-Casting Co.
Stewart-Warner Corp.
Sunstrand Machine Tool Co., Rockford.
Templeton, Kenly and Co., Ltd.
Trimm Radio Mfg. Co.
Underwriters' Laboratories, Inc.
Union Special Machine Co.
Wahl Co.
Western Electric Co.
Whiting Corp., Harvey.
Wilson and Co.
Youngstown Sheet and Tube Co., East Chicago, Ind.

APPENDIX II

PUBLICATIONS BY MEMBERS OF THE FACULTY

1937-1938

SAMUEL F. BIBB

Fundamentals of Algebra for College Students (First Revision) (Textbook)
Bibb and Spencer, Sept., 1937

CLAYTON O. DOHRENWEND

Solutions of the Elastic Curve Equation (Co-author with Horace B. Compton)
Rensselaer Polytechnic Institute Bulletin, Oct., 1937

HENRY P. DUTTON

The Engineer and the Business of Living
Armour Engineer and Alumnus, Oct., 1937

Both Employer and Community Profits Lie in Employee Training
Commerce, June, 1938

JOSEPH B. FINNEGAN

Fire Protection Engineering
Armour Engineer and Alumnus, Oct., 1937

Engineering Training for Future Executives
Manufacturers News, Mar., 1938

LESTER R. FORD

A review of Mrs. Logsden's "A Mathematician Explains"
American Mathematical Monthly, Oct., 1937

The "Arithmougraph" (designed for Armour Open House) May, 1938

FRANCIS W. GODWIN

Cooperative Coal Utilization Research
The Black Diamond, Mar. 12, 1938

Colloidal Fuel
Power Plant Engineering, V. 42, 1938
Proceedings of Midwest Power Conference, Apr., 1938

BILLY E. GOETZ

Review of Dantzig's "Number, The Language of Science"
Armour Engineer and Alumnus, Oct., 1937

LINTON E. GRINTER

Design of Reinforced Concrete in Torsion
A.S.C.E. Proceedings, Dec., 1937

Effect of Dowel-bar Misalignment Across Concrete Pavement Joints
A.S.C.E. Proceedings, Jan., 1938

Proceedings of Midwest Power Conference
Apr., 1938

Tests of a Precast-Slab Floor Panel
Armour Institute of Technology Technical Bulletin, Aug., 1938

ARTHUR S. HANSEN

Social Security for Municipal Employees
Municipal Finance Officers Record, Sept., 1937

Industrial Adjustment to Social Security Act
Proceedings of Industrial Relations Association, Nov., 1937

Employment Stabilization
Manufacturers News, Aug., 1938

HENRY TOWNLEY HEALD

Precast Reinforced Concrete Slabs for Roofs and Floors
Engineering News-Record, Oct. 21, 1937
Reprinted, Architectural Record, Jan., 1938

General Discussion of the Civil Engineering Curriculum
S.P.E.E. Civil Engineering Bulletin. Dec., 1937

Education and Business Stability
Proceedings of Industrial Management Society, 1938

WALTER HENDRICKS

A Day's Visit to Armour Institute of Technology
Armour Engineer and Alumnus, May, 1938

Reedited section on "Reference Books" for "Good Reading"
Council of Teachers of English, 1938

MAX JAKOB

The So-called Thermal Effect and the True Temperature of Catalytic Conversions
Transactions of American Institute of Chemical Engineers, V. 34, 1938

Flow Resistance in Cross Flow of Gases Over Tube Banks
Transactions of American Society of Mechanical Engineers, V. 60, 1938

Heat Exchange Research
The Frontier, June, 1938

ROBERT C. KINTNER

Operation of a Local Society
The Journal of Engineering Education, Jan., 1938

WILLIAM C. KRATHWOHL

Are You Happy With Your Work?
Armour Engineer and Alumnus, Dec., 1937
Reviewed in Educational Abstracts, Apr., 1938

Helping Mathematics With an Exhibit
The Mathematics Teacher, Feb., 1938

Methods of Effecting Better Coordination Between Mathematics and Technical Engineering Courses
The Journal of Engineering Education, Apr., 1938

JOHN DAY LARKIN

The Papers of Justice Holmes
Columbia Law Review, Dec., 1937

Review of Metcalf's "Collective Bargaining for Today and Tomorrow", Walsh's "C. I. O. Industrial Unionism in Action", and Brook's "When Labor Organizes'
The Society for the Advancement of Management Journal, May, 1938

EDWIN S. LIBBY

Mechanical Engineering Notes (Revision) Aug., 1938

HARRY McCORMACK

Nitration
Industrial and Engineering Chemistry, Dec., 1937

RUFUS OLDENBURGER

Real Canonical Binary Symmetric Trilinear Forms
Bulletin of the American Mathematical Society, Aug.-Sept., 1937

Relations Between Ranks of a General Matrix
Annals of Mathematics, Jan., 1938

Representation and Equivalence of Forms
Proceedings of the National Academy of Sciences, Apr., 1938

WILLIAM A. PEARL

The Metallography and Welding of High Strength Structural Steels
Proceedings of The American Gas Association, Aug., 1938

JAMES C. PEEBLES

Thermal Insulation Adds to Man's Comfort
Armour Engineer and Alumnus, Oct., 1937

JOHN C. PENN

The Hayden-Ickes Bill
Bulletin of the Associated State Engineering Societies, Apr., 1938

ROBERT V. PERRY

Dynamics of Reciprocating Engines (Manual) Oct., 1937

THOMAS C. POULTER

Use of Extreme Pressure in the Investigation of Lubrication
The Oil and Gas Journal, Dec. 23, 1937

Research at Extreme Pressures May Solve Fundamental Lubrication Problems
National Petroleum News, Dec. 29, 1937

Cooperative Research for Industry
Armour Engineer and Alumnus, Dec., 1937

Some Applications of Extreme Pressure Research
The Chemical Bulletin, Feb., 1938

Extreme Pressure Research
The Frontier, Feb., 1938

Mechanism of Cavitation
Journal of Applied Physics, May, 1938

JOHN J. SCHOMMER

Forward Pass Interference
Armour Engineer and Alumnus, Oct., 1937

WALTER H. SEEGRIST

Supplement and Guide to Engineering Drawing (Revision) Aug., 1938

JAMES S. THOMPSON

Physics Laboratory Manual (with other members of Physics Dept.) Sept., 1937

GEORGE E. ZIEGLER

X-Ray Diffraction Analysis
The Frontier, Apr., 1938

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CHICAGO, ILLINOIS

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PRESIDENT'S REPORT

NEW SERIES — VOLUME XXXIII : : NUMBER 4

NOVEMBER 1939

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Vol. XXXIII

No. 4

CHICAGO, ILLINOIS

NOVEMBER, 1939

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PRESIDENT'S REPORT

FOR THE YEAR ENDED AUGUST 31, 1939

To the Board of Trustees:

The following report primarily deals with the activities of the Institute during the fiscal year ended August 31, 1939. A discussion of the consolidation of Armour and Lewis is included because of its importance, although it was not agreed upon until October, 1939. A separate report on the activities of the Research Foundation has been made.

CURRENT OPERATION

Administrative Staff

At the meeting of the Board of Trustees held May 22, 1939, the appointment of Dr. Linton E. Grinter as Vice President was authorized. In this position, Dr. Grinter has immediate responsibility, under the President, for the educational and financial policies of the Institute. He continues with his duties as Dean of the Graduate Division but relinquishes his position as Director of the Civil Engineering Department. At the same meeting, the appointment of Mr. Harold A. Vagtborg as Executive Secretary to the Board of Trustees was confirmed. In this position, Mr. Vagtborg combines with the directorship of the Research Foundation major activities connected with the general Institute development program.

The position of Director of Public Relations was discontinued in February, 1939, when Professor David P. Moreton requested a leave of absence due to poor health, and the position of Assistant to the President was abolished with the resignation of Mr. A. B. Lewis in June, 1939.

New Faculty Appointments

With the transfer of the laboratories in materials testing and in hydraulics from the Department of Mechanical Engineering to the Department of Civil Engineering, Professor Philip C. Huntly

became Director of the Civil Engineering Department, and Professor James C. Peebles was appointed Chairman of the Mechanical Engineering Department for the year 1939-40.

Numerous additions have been made to the faculty to provide for increased enrollment and replacements due to resignations and retirements. These are, as follows: Civil Engineering—Dr. Joseph Marin as associate professor; Dr. Rolf Eliassen and Dr. Merit P. White, assistant professors; Mr. LeVan Griffis, instructor. Chemical Engineering—Dr. Ralph E. Peck, instructor. Chemistry—Dr. Maurice J. Murray, assistant professor; Dr. Bruce Longtin, Dr. Hugh J. McDonald, and Mr. Melvin L. Schultz, instructors. English—Dr. Grant McColley, assistant professor; Dr. Samuel I. Hayakawa and Mr. Robert M. Sanford, instructors. Fire Protection Engineering—Mr. Swen Anderson, instructor appointed in February, 1939. Mechanical Engineering—Dr. Lloyd H. Donnell, associate professor; Dr. Rudolph G. Minarik, assistant professor appointed in February, 1939; Mr. Eugene F. Murphy, Mr. Herbert B. Nottage, and Mr. Paul R. Trumpler, instructors. Mathematics—Dr. John W. Calkin, assistant professor; Dr. George E. Hay and Dr. Arvid T. Lonseth, instructors. Physics—Dr. Forrest F. Cleveland, assistant professor. Social Science—Dr. Harold W. Davey, instructor.

Mr. Earle L. Kent returned from a year's leave of absence spent at the University of Michigan.

Dr. Floyd W. Mohlman, distinguished sanitary chemist, was the first faculty member appointed to the newly created rank of Adjunct Professor.

Promotions

Dr. Rufus Oldenburger was promoted to Associate Professor of Mathematics, Dr. Elder Olson to Assistant Professor of English, and Dr. James Potter to Assistant Professor of Physics.

Leaves of Absence

Dr. Sanford Meech, Assistant Professor of English, was granted a year's leave of absence to accept a visiting professorship at Syracuse University.

Retirements

Professor Melville B. Wells, for thirty-eight years a member of the Department of Civil Engineering, loved and revered by successive generations of Armour students, retired at the end of the year with the title of Professor Emeritus.

Changes in Duties

Professor Edwin S. Libby, for thirty-four years a member of the Department of Mechanical Engineering, relinquished his teaching to become Chief Engineer of the Power Plant on September 1, 1939. Dr. Ralph Manley, formerly Assistant Professor of Chemistry, is now devoting practically all of his time to the Research Foundation as Assistant Director. He maintains the rank of Associate Professor of Chemistry.

Resignations

In February, 1939, Mr. Herbert Ensz, Associate Professor of Civil Engineering, resigned to accept a position with the Chicago Subway Commission. Mr. Clayton O. Dohrenwend, Instructor in Civil Engineering, accepted a position at Connecticut State College. Mr. Walter B. Fulghum went to Northwestern University, and Dr. John A. Schaad joined the staff of the Chicago Junior Colleges. Mr. William B. Ahern, Instructor in Electrical Engineering, returned to engineering practice, as did Mr. Jarl T. Sorensen of the Fire Protection Engineering Department, and Mr. Ernest Freireich of Chemical Engineering. Other resignations included Mr. Merrill G. Christophersen, Instructor in English; Dr. Austin D. Sprague, Instructor in Physics; Dr. Dawson G. Fulton, Instructor in Mathematics; and Dr. Floyd A. Van Atta, Instructor in Chemistry.

Enrollment

During the year enrollment in day classes continued to increase, again reaching an all-time high for the Institute. Evening enrollment showed some decrease from the previous year due to lessened business activity. The following table summarizes the figures for the last six years:

Year	College		Evening Division		Summer	Total Students
	1st Sem.	2nd Sem.	1st Sem.	2nd Sem.		
1933-34	848	817	438	403	*198	1473
1934-35	788	774	638	544	192	1690
1935-36	788	849	814	707	212	2030
1936-37	913	1030	1412	1309	218	3074
1937-38	1114	1242	2220	1787	426	4094
1938-39	1305	1362	1853	1503	503	3830

* Figures in this column show enrollment for the preceding academic year.

A factor not brought out in this table is the relatively large proportion of students desiring to major in mechanical engineering and chemical engineering. This has produced an unbalanced enrollment in the major departments of the Institute and with it certain problems of adjustment. College enrollment for 1939-40 again exceeds the previous year, and with the admission of new cooperative students in February, the college enrollment should be fairly well stabilized at about 1500 students, of whom approximately 350 will be enrolled in the cooperative course.

Undergraduate College

During the past scholastic year the curriculum in Architecture has been revised to adjust it to the educational program laid out by Professor Ludwig Mies van der Rohe, who assumed the direction of the Department in September, 1938. Changes have been made with especial care not to disturb the continuity of the students' education. The revised curriculum is described in the current issue of the General Information Bulletin.

Substantial revisions were made in the curriculum in Engineering Science, and the name was changed to Science. The new program permits a student to specialize in chemistry, mathematics, or physics, while at the same time securing a background of applied courses in one of the fields of engineering.

In February, 1940, the Cooperative Course in Mechanical Engineering will reach its full strength with the admission of the fifth entering class. This course has now become a well established integral part of the Armour program. More than one

hundred companies are cooperating with the Institute, and, even during the relatively poor business conditions which have existed in many industries, employment of cooperative students continued to be good.

Armour's student personnel program covering admissions, testing and counselling is proving to be increasingly effective. Dean Tibbals feels that data secured from the educational tests and analyzed by Professor Krathwohl is proving especially useful in predicting success in college, and, when combined with the counselling work carried on by Mrs. Orcutt and the student advisers, provides an excellent background for helping individual students with their problems. The basic aim of the student personnel program is to assist in the selection of properly qualified students and to provide every assistance to the student admitted, in order that he may realize the greatest possible value from his educational experience.

In accordance with Armour's policy of developing the whole man, extra-curricular activities such as athletics, both varsity and intramural, musical clubs, publications, dramatics, and fraternities engage the attention of a very large percentage of the student body. Facilities for some of these activities have been materially improved with the completion of the Student Union, but space and equipment for proper athletic pursuits is still entirely inadequate.

A majority of Armour students come from modest homes and to many of them the financial problems involved in securing a college education are especially burdensome. Some important assistance is given through scholarships, loan funds, part-time employment and the National Youth Administration program, but many needy and deserving cases cannot be met with current resources. There are few, if any, more satisfactory means of well-doing than by providing scholarships for worthy young men, and it is earnestly hoped that friends of the Institute will meet this need.

Evening Division

Four years ago an integrated program to enable qualified young men to complete the first two years of the regular degree

curricula in the Evening Division was begun. This work has proved itself to be especially valuable and is now responsible for a large portion of the evening enrollment. The time now seems ripe for an extension of the evening courses in order to make it possible for a student to earn the engineering degree by evening class attendance. Dean Dutton of the Evening Division is developing a curriculum to meet this need, and it will probably be in operation with the beginning of the 1940-41 school year.

The work of the past year in the Evening Division was principally concentrated on improving registration procedures, increasing the quality of instruction, and providing more guidance for the individual student. Nevertheless, several new courses were offered, and one of the most interesting programs was the organization of a course in iron and steel production, in cooperation with the Chicago Chapter of the Association of Iron and Steel Engineers, and presented in East Chicago, Indiana, for employees of the steel industry. Extension classes of this type are a useful field of endeavor, and their development in a variety of fields at various locations in the Chicago area may well prove to be a means whereby the Institute can still further enhance its services to industry and to the community.

Instruction in the Evening Division continued to be carried on to a large extent by members of the regular teaching staff, supplemented by part-time instructors obtained for specific courses. Location of the Institute in a great industrial area makes it possible to secure the services of well qualified men from industry in a great variety of fields, and in many cases men of more than ordinary distinction employed in industry are interested in a part-time teaching connection.

Graduate Division

Dean Grinter reports that the graduate work at the Institute has improved in quality and increased noticeably in volume during the past year. The use of graduate assistants has justified itself both economically and as an aid in teaching. The reluctance formerly expressed by some department heads to use this service has largely disappeared and the demand for added assistants has been noticeable.

Graduate registration in the evening increased in volume despite a decrease in enrollment of other evening students. Three hundred and twenty-six individuals were registered in evening graduate courses during the year, and there is reason to believe that about one-half of this group may complete the requirements for the Master's degree.

A feature of the year's work was the award at the 1939 Commencement of the first Doctor of Philosophy degree to be granted by the Institute. At the same time, fourteen Master of Science degrees were awarded, including the first graduate degrees earned exclusively in the evening classes. The number of Master's degrees awarded annually should continue to grow, although the awarding of Doctor's degrees is not expected to exceed one or two each year until greater facilities are made available.

It should be made clear that important improvements in the graduate program are only going to be made possible by the expenditure of substantial funds for equipment, research facilities, and teaching staff. Money spent for this purpose will not only improve the graduate program but will greatly strengthen the undergraduate program, and will enhance the Institute's reputation in all divisions.

Library

The utility and general effectiveness of the library was greatly improved during the year by the installation of completely new double-deck steel stacks and by the addition of study space for one hundred and sixty students in the Student Union, thus relieving to a considerable extent the excessive load on the reference room. The new stacks made it possible to combine the books formerly stored in Chapin Hall with the regular collection, and, with the exception of some duplicate sets now kept at the Glessner House, all the books are readily accessible.

The use of the library has been growing steadily, and will no doubt continue to increase. Some of the factors contributing to this growing demand are an increasing emphasis on collateral reading, the increasing number of graduate students,

increasing use made of the library by alumni and industrial concerns, increasing demands made by the Research Foundation, and new subjects in the curriculum.

More than two hundred volumes were added to the library during the year by gifts from alumni and friends. Space does not permit a complete inventory of these contributions but among the more important ones were collections received from the Class of 1912, from Mrs. J. Ogden Armour, McCrillis M. Butler, Mrs. F. H. Bernhard, James O. Heyworth Estate, H. F. Hodges, A. A. Koch of the Class of 1932, and Colonel Warren R. Roberts. Gifts of this kind are particularly helpful, and often make it possible for the library to add important volumes which the regular book budget will not allow.

Research Foundation

Since the Research Foundation is a separate corporation, it is not the province of this report to include a detailed account of its activities. Nevertheless, it seems pertinent to register satisfaction with the real progress made by the Foundation during the past year. In addition to the indirect values rendered to the Institute through the enhancement of its reputation due to activities of the Foundation, very tangible assistance has been given to the educational program through the provision of staff and facilities for advanced work. It now seems clear that the activities of the Research Foundation are destined to become one of the most significant parts of the Institute service. A complete report of the work of the Foundation was printed in "Industrial and Engineering Chemistry" for October 10, 1939. Reprints are available on request.

Public Activities of the Institute

While the primary obligation of an institution such as Armour may be construed to be to provide instruction for its students and to advance the frontiers of knowledge through research, it is nevertheless necessary that the Institute and the members of its staff take an active part in community affairs.

The dinner for Ludwig Mies van der Rohe, given in cooperation with the American Institute of Architects and the Illinois

Society of Architects, proved to be a notable gathering of architects as well as those interested in the art.

During the year, public lectures to which members of the engineering profession were invited were given by Dr. Charles Terzaghi, international authority on soil mechanics, and Professor Hardy Cross, eminent structural engineer from Yale University. Both events were well attended, not only by Institute staff members but by the engineering public.

A series of weekly radio programs designed to interpret the work of the engineer to the public was presented throughout the year on radio station WCFL. Programs of this sort serve a useful purpose but really effective educational work of this type involves the development of a type of presentation that requires more money than is at present available for the purpose. The Armour Tech Musical Clubs presented several excellent broadcasts, and appeared in as many concerts before civic organizations as the students' schedules would permit.

The quarterly magazine, Armour Engineer and Alumnus, continues to publish interesting discussions on science and engineering, while at the same time carrying the story of the Institute's progress to all alumni and several thousand friends.

During the year, an attractive booklet entitled, "Bridging the Gap," designed to interpret Armour's activities and needs in a pictorial fashion, was prepared and distributed to a selected group. As a part of a general policy of presenting information about the Institute's activities to the public, a systematic plan for release of information to the press, developed by Mr. Alexander Schreiber, has proved increasingly effective.

Many members of the Armour faculty are regularly called upon to visit high schools in the Chicago area to discuss engineering education and to supply guidance and counsel to prospective engineering students. Professor Joseph B. Finnegan has himself made many such visits and has handled the general arrangement for the entire group.

The 1939 Commencement exercises were held at the Museum of Science and Industry, with Mr. Franklin H. Fowler, President of Foote Bros. Gear and Machine Company, as the speaker.

An unusually pleasant feature of the exercises was the awarding of two honorary degrees of Doctor of Engineering, the first such degrees to be given by Armour in nine years. The recipients were Mr. Joseph S. Duncan, inventor of the Adressograph, a resident of Chicago for more than forty-five years, and until his retirement, president of the Addressograph Company; and Mr. Howard L. Krum, an alumnus of the Class of 1906, inventor of the Teletype and now consulting engineer for the Teletype Corporation.

Professional Activities of Staff Members

The professional activities of members of the Armour faculty have been increasing rapidly in the last few years. Staff members are active in practically all of the local and national engineering societies as well as in scientific and learned organizations. These activities take the form of serving as officers and committee members, presentation of discussions on various scientific and professional programs and widespread attendance at meetings. It is the policy of the Institute to encourage participation of this sort and, to that end, all possible assistance is given in meeting travelling expenses and making arrangements for attendance at various national conventions. Activities of this nature do not necessarily result in publications but the list of publications included in the Appendix serves as a representative sample of writing done by staff members during the year. An increasing number of Armour faculty members are engaged in fundamental research programs, and the sum total of their contributions to knowledge is growing rapidly.

BUILDINGS AND EQUIPMENT

Student Union

The most important improvement in physical facilities during the year was the completion of the Student Union through the remodeling of the Armour Mission Building. Thus Armour's oldest building now becomes its most modern, and the students are provided with facilities long needed for service and comfort. The building now contains a modern restaurant with large and small dining rooms, an assembly hall, study space, small meeting rooms, the student supply store and a large student lounge.

Operation of the building is in the hands of a student board, with Mr. Bernard Weissman serving as Union Manager. Since the opening of the building in December, 1938, its use has been intensive. Thousands of meals have been served to students and faculty in the regular course of procedure and many special groups have used its facilities for meetings, dances and various types of gatherings. In fact, the use of the building has been so intensive and the results obtained so gratifying that it is difficult to see how Armour students did without such accommodations for more than forty years.

Graduate Club

The large three-story house at 3254 Michigan Avenue was acquired for use as a Graduate Club, and has now been equipped to house thirty graduate students. It is believed that this will prove to be an extremely useful building inasmuch as heretofore there has been great difficulty in finding suitable living quarters within a reasonable distance of the Institute.

General Improvement of Plant

The general program of systematically improving the Institute plant, begun three years ago, has been continued during the last year. Mention has been made already of new library facilities. Rearrangement of the experimental engineering laboratory provides more space for materials testing and hydraulics which remain in the Main Building but removes the steam laboratory to new space in Machinery Hall. Considerable rehabilitation of class room and office space in the Main Building, as well as a new and modern washroom, has added materially to its usefulness.

Laboratories in the Physics Building have been enlarged and a substantial amount of remodeling has been completed in Chapin Hall. Expanding activities of the Research Foundation have made it necessary to remove Social Science offices to new quarters in Chapin Hall and several new offices and laboratories for other departments were provided at the same time.

ALUMNI

The opening of the new Student Union in December, 1938, was made the occasion of the first alumni reunion held at the Institute. Several hundred alumni gathered to view the building and to renew old friendships, and unanimously expressed the opinion that an annual function of this sort should be held in addition to the regular Alumni Association banquet which takes place each year in the Loop.

During the year, a plan for securing an annual gift from each alumnus was organized and put into operation by the Alumni Association under the chairmanship of J. Warren McCaffrey, '22. Many members of the alumni body, both in Chicago and throughout the country participated in this program as workers as well as contributors, and the contributions received were used to apply against the cost of furnishings for the new Student Union. The Institute is deeply grateful for this help because it has made possible improved facilities for the current generation of students, and it is hoped that as this program is continued from year to year, the alumni will take real satisfaction in participating in the continued development of Armour.

For the first time in several years an alumni directory listing all known alumni was published and distributed. This directory proves of real service not only to alumni scattered throughout the United States but also to members of the staff at the Institute.

In September, 1938, the alumni placement service was reorganized under the directorship of John J. Schommer. Although somewhat handicapped at the beginning of the year by inadequate office facilities and rather scattered placement records, Mr. Schommer has done an outstanding piece of work in placing Armour graduates. Through his office, interviews were arranged with seventy companies, many of which sent representatives direct to the school and interviewed seniors in the placement office. All graduates of the Class of 1938 were employed shortly after Mr. Schommer undertook the work, and, as this is written, more than ninety per cent of the graduates of the Class of 1939 have been placed satisfactorily. The continued development of the placement activity on the systematic basis on which it is now operating will be of very real financial

value to all Armour alumni, and will at the same time improve the reputation of the college with the industries which employ its graduates. The Institute is fortunate in securing the special abilities which Mr. Schommer has to give to this work.

FINANCIAL REVIEW

Many of the problems of educational institutions have their genesis in finances. In this respect, Armour Institute of Technology is no exception. In spite of the fact that very substantial educational progress has been made in the past few years, the financial support for the college as a whole is still far from adequate. Careful control and intensive use of educational facilities have enabled the Institute to carry on a calibre of work which, in contrast to the money available for it, is rather remarkable when compared to the record of most educational institutions.

Annual income from tuition, from endowment, and miscellaneous non-educational activities is not sufficient to meet annual expenses, and consequently money must be raised each year for what is known as the Sustaining Fund. During the year 1938-39, contributions to this fund increased nearly fifty per cent over the previous year and many new contributors were obtained.

The most significant gift of the year was $50,000 from Mrs. J. Ogden Armour to be used to defray a portion of the expenses of the Department of Architecture for a five year period. Mrs. Armour has long been interested in the Institute program, and this gift which made possible the reorganization of the Department of Architecture was especially timely. In addition to gifts to the Sustaining Fund, the Institute received several substantial gifts for capital purposes and general development. A more detailed report giving recognition for these gifts cannot be made until certain parts of the development program now in process have been completed.

Total income from all sources, exclusive of the Research Foundation, applicable to current operation was $584,888.06, while total expenditures were $581,395.42. Grateful recognition is given to the companies and individuals who contributed funds

so necessary for the Institute's Sustaining Fund during the past year. Continuation of these contributions together with additional support which may be enlisted from other sources will provide the increased funds necessary to support the improved program of education which Armour students so richly deserve. Nevertheless, major progress in improving the services which Armour Institute of Technology is able to render to the community is only going to come through substantial gifts for buildings, for equipment, and for endowment.

BOARD OF TRUSTEES

The membership of the Board of Trustees was changed during the year by the death of two members, the resignation of three members, and the election of eleven. It is with deep regret that we record the passing of Mr. Homer H. Cooper, General Counsel for the Institute for the last five years. Mr. Cooper, an outstanding member of the legal profession, had given unstintingly of his time and effort in advancing the Institute's program. His loss is keenly felt. Mr. Charles H. Strawbridge, who was elected to the Board of Trustees in October, 1938, passed away in May, 1939. Although Mr. Strawbridge had been a member of the group for only a short time, he had given much valued service, and was Chairman of the Board Committee on Pensions and Retirements. Messrs. Vincent Bendix and George I. Haight relinquished their membership at the expiration of their term in October, 1938, and Mr. L. A. Downs in October, 1939.

Mr. Charles B. Nolte, President of Crane Company; Mr. C. L. Rice, Vice President of the Western Electric Company; and Mr. Harold S. Ellington, alumnus of the Class of '08, were elected to membership in October, 1938. General Robert E. Wood, Chairman of Sears, Roebuck and Company; Mr. Sydney G. McAllister, President of International Harvester Company; and Mr. Frank A. Hecht, prominent civic leader, were elected in January. The Board was further strengthened, in May, by the addition of Mr. Thomas Drever, President of American Steel Foundries; Mr. Ralph H. Norton, President of Acme Steel Company; and Mr. John M. Frank, President of Ilg Electric Ventilating Company; and, in October, by the election of Mr. Franklin M. deBeers, alumnus of the Class of '05; and Mr. Louis S. Hardin of the law firm of Pam, Hurd & Reichmann.

At the January meeting of the Board of Trustees, the by-laws were amended to change the membership of the Board from forty-two to forty-eight. Armour is extremely fortunate in the membership of its Board of Trustees. Few educational institutions have been successful in obtaining the interest of such an outstanding group of citizens.

Members of this Board, individually and collectively, have aided the Institute in a great variety of ways. Mr. James D. Cunningham, who has served as Chairman for the last seven years, has given liberally of his time and energy not only in guiding the Institute's policies but also in securing financial assistance. The same can be said of other members of the Executive Committee, and in particular of Mr. Alfred L. Eustice, without whose support the Institute's progress would have been greatly handicapped. Mr. Newton C. Farr has continued to render outstanding service in connection with real estate problems. We are particularly fortunate in having such excellent assistance from Mr. Farr and his organization. Practically every member of the Board has interested himself in one or more specific activities of the Institute, and the members of the staff feel extremely fortunate in having the advice and counsel of such a fine group of men.

Mr. Louis Hardin accepted the position of Legal Counsel for the Institute in June, 1939. Although his official election as a trustee did not take place until the October meeting, Mr. Hardin has already proved himself to be a worthy successor to Mr. Cooper.

ARMOUR-LEWIS COMBINATION

At its meeting on October 9, 1939, the Board of Trustees of Armour Institute of Technology ratified an agreement with the Trustees of Lewis Institute to consolidate the two institutions into a single technological institution to be known as Illinois Institute of Technology, having, as its major divisions, Armour College of Engineering and Lewis College of Science. This combination brings together two schools each of which has been serving Chicago and the Middlewest for almost fifty years.

The consolidation agreement was entered into only after months of careful study by both the Armour and Lewis trustees,

and it is the unanimous opinion of the members of both Boards that the combination will result in greatly improved educational opportunities for the youth of this area and greatly increased service to industry. For the time being, it will be necessary to operate the plants of both institutions, but this can be done effectively by concentrating the day engineering program at Armour and the arts and science work at Lewis.

The basic purpose of the combination is to integrate the work of the two schools, to eliminate duplication, and to develop an improved educational program. The combined institution will result in one of the largest technological centers in the world with a total enrollment of approximately 7,000 day and evening students. Alumni and former students will number more than 100,000. It will be an objective of the new institution to integrate the fields of science, engineering, management, and humanities, now taught in both colleges, in a manner which will broaden and strengthen the whole. It is felt that emphasis on the humanities and social sciences as well as engineering and the physical sciences is necessary to meet the broad educational objectives of the Institute, which will be to produce a student of wider intellectual interests than has commonly been true of graduates in technology.

Actual formation of the new corporation, Illinois Institute of Technology, awaits the completion of certain court proceedings now under way, but it is expected the educational program will be operated on a combined basis beginning with the Fall of 1940.

SUMMARY

No one who has followed the fortunes of Armour Institute of Technology during the past three years can fail to note the signs of real growth and development. Enrollment in the college has grown rapidly while at the same time the quality of the students admitted has steadily improved. Paralleling the growth in enrollment has been an increase in the size of the faculty, and the improvement in the calibre of men Armour has added to its staff has been even more marked than their increased numbers. Nor has the strengthening of the faculty been by any means entirely due to additions. The whole-

hearted cooperation given by older faculty members, as well as new, has been an important factor in improving the general effectiveness of the entire institution.

The growth of the Research Foundation and establishment of a strong graduate program, with its increased emphasis on faculty research, have been thoroughly stimulating influences. The cooperative program in mechanical engineering has won wide acceptance both within the institution and among the industries of the Chicago area. Evening classes are serving the needs of the community more effectively than ever before and promise to be increasingly important in years to come. Marked improvements have been made in plant and equipment.

Public interest and support for Armour has been measurably improved and the Board of Trustees has been greatly strengthened. Financially, Armour is on a sound basis as evidenced by the fact that operating expenses are within operating income. Certainly this record of progress in the face of relatively meager financial support is a creditable one. Now comes the combination of Armour and Lewis, with its enlarged opportunities for service, increased financial resources, and, at the same time, an increased obligation to the community. As result of the consolidation, support now divided between the two colleges will be unified, and unusual opportunity is presented for those who wish to support education and research in technology to concentrate their efforts upon one major institution in order that the additional resources and new facilities so greatly needed may be provided.

Respectfully submitted,

HENRY TOWNLEY HEALD
President

APPENDIX

PUBLICATIONS BY MEMBERS OF THE FACULTY
1938-1939

SAMUEL F. BIBB

Fundamentals of Algebra for College Students (Textbook—Third Revision) (Bibb and Spencer)
Edwards Bros., publishers

WILLIAM W. COLVERT

Review of Culver's "Textbook of Physics"
American Physics Teacher, Oct., 1939

PAUL L. COPELAND

Secondary Emission of Electrons from Sodium Films Contaminated by Gas
Physics Review, June, 1939

S. H. V. of Stretched Rect. Membrane
American Physics Teacher, Aug., 1939

CLAYTON O. DOHRENWEND

Photo-Elasticity in Engineering
Journal of the Western Society of Engineers, Oct., 1938

HENRY P. DUTTON

Company Training Programs and the Evening School
Manufacturers' News, Aug., 1939

HERBERT ENSZ

Model Studies in Foundation Engineering
Journal of the Western Society of Engineers, Oct., 1938

HENRY G. FISK

Petrographic Methods
The Frontier, June, 1939

PATRICK J. FITZPATRICK

Dropwise Condensation of Steam on Vertical Tubes
Trans. American Institute of Chemical Engineers, 1939

LESTER R. FORD

Fractions
American Mathematical Monthly, Oct., 1938

FRANCIS W. GODWIN

Stopping the Bullet (Godwin and Walker)
Leica Photography, March, 1939

Photography in Research
Armour Engineer and Alumnus, May, 1939

When Bullet Hits Glass
Kodak, June, 1939

Effect of Storage Conditions on Dust Allaying Treatment
Coal Heat, Aug., 1939

BILLY E. GOETZ

Review of Reitell and Vansickle's "Accounting Principles for Engineers"
Society for the Advancement of Management Journal, March, 1939

LINTON E. GRINTER

Determining Influence Lines by Balancing Angle Changes
Engineering News Record, Oct. 6, 1938
Armour Institute of Technology Technical Bulletin, V. 1, No. 2, Dec., 1938

Misconceptions of the Usefulness of Model Studies
Journal of the Western Society of Engineers, Oct., 1938

Solution of Equations in Structural Analysis by Converging Increments (Discussion)
Proceedings of the American Society of Civil Engineers, Feb., 1939

Specifications and Design of Steel Gusset Plates (Discussion)
Proceedings of the American Society of Civil Engineers, Feb., 1939

Design of Dowels in Transverse Joints of Concrete Pavements (Discussion)
Proceedings of the American Society of Civil Engineers, March, 1939

Direct Design of Continuous Beams
Engineering News Record, March 16, 1939
Proceedings, Midwest Power Conference, May, 1939

Final Report on C. E. Library List (Committee on Library Facilities, SPEE), June, 1939

Automatic Design of Continuous Frames
Civil Engineering, June, 1939

Philosophy of Automatic Design for Continuous Frames
Journal of the Western Society of Engineers, June, 1939

WILLIAM HAMMER

Review of W. S. Heckscher's "Die Romruinen"
Classical Philology, Oct., 1938

Encomia of Cities from Antiquity to Humanism
Published privately for the University of Chicago Library

The Student in Present Society
Armour Engineer and Alumnus, May, 1939

CECIL EDGAR HAMMET

Descriptive Geometry
Mimeographed textbook

ARTHUR S. HANSEN

Costs of Amendments to Railroad Retirement Act
Railroad Pension Review, Feb., 1939

Profit Sharing in Industry
Society for the Advancement of Management Journal, April, 1939

Proposed Amendments to Railroad Retirement Act
Railroad Pension Review, May, 1939

WALTER HENDRICKS

First Aerial Tramway in North America
Armour Engineer and Alumnus, Dec., 1938

Short Stories of Distinction
Packard & Company, publishers

MAX JAKOB

Der Chemie-Ingenieur Vol. 3 Part 2 (Co-editor with A. Eucken)
Akadem, Verlagages

Der Chemie-Ingenieur Vol. 3 Part 4 (Co-editor with A. Eucken)
Leipzig

The Influence of Pressure on Heat Transfer in Evaporation
Proceedings Fifth International Congress of Applied Mechanics
Technical Bulletin of Armour Institute of Technology, Vol. 2, No. 1, July, 1939

A Survey of the Science of Heat Transmission
Bulletin of the Purdue Engineering Experimental Station No. 68, Aug., 1939

Measurements of the True Temperature and the Heat Exchange in a Catalytic Reaction
Transactions of American Institute of Chemical Engineers, Aug., 1939

The Absorption of Gases in Wet Cyclone Scrubber
Transactions of American Institute of Chemical Engineers, Oct., 1938

V. I. KOMAREWSKY

Dehydropolymerization of Ethylene
Industrial and Engineering Chemistry, V. 30, Sept., 1938

WILLIAM C. KRATHWOHL

We Measure our Freshmen
Armour Engineer and Alumnus, Dec., 1938

HALDON A. LEEDY

Acoustics and Vibrations
The Frontier, Dec., 1938

A Theoretical Determination of Sound Absorptivities by the Impedence Method with Experimental Verification
Journal of Acoustical Society of America, Apr., 1939

HARRY McCORMACK

Instructional Relationships between Chemistry and Chemical Engineering
Journal of Chemical Education, Oct., 1938

Ethylation and Hydroxylation
Journal of Industrial and Engineering Chemistry, March, 1939

LUDWIG MIES VAN DER ROHE

Architectural Education
Armour Engineer and Alumnus, Dec., 1938

JOHN L. MILLER

The Metallurgy of Welds (J. C. Dodge & J. L. Miller)
Welding Handbook, Nov., 1938

RUDOLPH G. MINARIK

New Method of Selective Hardening
Heat Treating and Forging, Aug., 1939

RUFUS OLDENBURGER

Rational Equivalence of a Form to the Sum of p-th Powers
Transactions of the American Mathematical Society, Sept., 1938

Transitivity Theorem in "Symbolic Dynamics" by Morse
American Journal of Mathematics, V. 40, Oct., 1938

Decomposition of Elements in Abelian Groups
Bulletin of the American Mathematical Society, Feb., 1939

Les Numbres Minimals Des Formes
Comptes Rendus, V. 208, June 12, 1939

ELDER OLSON

Linguistics General Prosody: Rhythmic, Metric, Harmonic
University of Chicago Press, Oct., 1938

Rhetoric and the Appreciation of Pope
Modern Philology, Aug., 1939

ANNA C. ORCUTT

Study Techniques
Planographed

WILLIAM A. PEARL

The Metallography & Welding of High Strength Structural Steels
Proceedings of National Convention, American Gas Association, Oct., 1938

Metallurgy of the Weld Zone
The Welding Engineer, March, 1939

Properties of Coal that Affect Burning Characteristics
Proceedings of Annual Convention, Smoke Prevention Association, June, 1939

JOHN C. PENN

The Teaching of Land Surveying
Bulletin of Associated State Engineering Society, Apr., 1939

ROBERT V. PERRY

Dynamics (Swineford & Perry)
Planographed

JAMES G. POTTER

Temperature Dependence of the Work Function of Tungsten
Physical Review, July 15, 1939

THOMAS C. POULTER

Extreme Pressures and Their Importance in the Investigation of Engineering Problems
Armour Engineer and Alumnus, Dec., 1938

Scientific Work of the Second Byrd Antarctic Expedition
The Scientific Monthly, July, 1939

HANS REISSNER

Elastic Instability of Tubular and Panel Shaped Cylindrical Shells
Proceedings of the Fifth International Congress of Applied Mechanics, 1938
Technical Bulletin of Armour Institute of Technology, V. 2, No. 1, July, 1939

DANIEL ROESCH

Critical Whirling Speeds
(Laboratory Instructions)

MICHAEL SADOWSKY

A Tetrahedral Riemann Surface Model of a Closed Finite Locally-Euclidean Two Space
American Mathematical Monthly, April, 1939

JOHN A. SCHAAD

Exercises in College General Chemistry
(Laboratory Manual)

WALTER A. SPENCER

Basic Principles of Analytical Geometry (in three-dimension pictures)
The Orthovis Publishing Co.

Fundamentals of Algebra for College Students (Textbook—Third Revision)
(Spencer and Bibb)
Edwards Bros., publishers

ROE L. STEVENS

Structural Analysis by Models
Journal of the Western Society of Engineers, Oct., 1938

CHARLES R. SWINEFORD

Dynamics (Swineford & Perry)
Planographed

JAMES S. THOMPSON

Radium in Treatment of Diseases of the Skin (In collaboration with Dr. F. E. Simpson)
Illinois Medical Society Journal, June, 1939

CHARLES A. TIBBALS

Armour Today
Armour Engineer and Alumnus, May, 1939

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Armour Magazine, Armour & Co., Aug., 1939

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HAROLD A. VAGTBORG

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Journal of Applied Physics, Sept., 1938

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The Frontier, Sept., 1938

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Armour Engineer and Alumnus, Oct., 1938

Research Foundation of Armour Institute of Technology
Chemical Bulletin, Oct., 1938

Research and Industry
Central Mfg. District Magazine, Feb., 1939

Why Research?
Manufacturers News, Feb., 1939

ALFRED O. WALKER

Stopping the Bullet (Walker & Godwin)
Leica Photography, March, 1939

STANTON E. WINSTON

Machine Design
Published by American Technical Society

GEORGE E. ZIEGLER

The X-Ray Analysis of Solids
The Frontier, March, 1939

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Journal of Physical Chemistry, V. 43, 1939

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